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lucidum *Rolfe*, 160
Klugii *C.Schweinf.*, 159

Issued February 6, 1953

ERRATA

page 15, line 31
for hunc, read hoc

page 45, line 18 through page 49, line 17 (**Senefelderopsis** et seq.)
insert on page 48, line 17 following *Sapium Aubletianum*

page 94, line 16
for genus, read subgenus

page 95, line 33
insert No. after Mus.

page 99, line 31
for ones, read one

page 138, line 6
for *serapo*, read *sarapo*

page 182, line 5
for refer, to, read refer to,

page 190, line 1
for Spruceanum, read Spruceanus

page 198, line 25
for carboniferous, read Carboniferous

explanation of Plate LXI, line 3
for *endrocentrica*, read *endocentrica*

page 211, line 11
for *crassipes*, read *Sprucei*

page 223, line 17
for A. V., read Alfred

page 228, line 12
for tuff, read tuft

page 231, line 15
for glume, read glumes

page 240, line 5
for *Chrysoma*, read *Chrysomya*

page 252, line 4
for abrubt, read abrupt

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ORCHIDACEAE PERUVIANAE VII

BY
CHARLES SCHWEINFURTH

IN THE following article, which is the seventh in the series concerning Peruvian orchids, there are descriptions of fourteen new species, with accompanying plates, together with several new varieties and nomenclatorial notes.

The sequence of the species follows the system proposed by R. Schlechter in Notizblatt des Botanischen Gartens und Museums Berlin-Dahlem 9 (1926) 563–591.

Pogonia Vargasii *C. Schweinfurth sp. nov.*

Herba terrestris, stricta. Caulis cum vagina unica subtus et foliis paucis remotis supra ornatus. Folia oblongo-lanceolata vel lineari-lanceolata, acuta vel acuminata, sessilia, amplexicaulia. Flores saepissime duo, remoti, pro genere parvi, punicei. Sepalum dorsale lanceolato-oblongum, acutum. Sepala lateralia similia sed angustiora, anguste elliptico-oblonga. Petala oblongo-elliptica vel anguste obovato-oblonga, sepalis breviora sed multo latiora. Labellum in circuitu elliptico-ovatum vel oblongo-ovatum, supra trilobatum, cum lobo terminali parvo et rotundato-obovato; discus fascia mediana lata multipapillosa percursus. Columna segmentis ceteris brevior.

Plant terrestrial, strict, more or less slender. Root solitary, tuberous, straight, lanuginose, about 8.2 cm. or less long, sometimes with small lateral rootlets. Stem

about 69 cm. or less tall, glabrous, with a small close tubular sheath in the lower portion and with two to four remote leaves above. Leaves strict, oblong-lanceolate or linear-lanceolate, acute or acuminate, sessile with an amplexicaul base, up to 10 cm. long and 1.3 cm. wide (the uppermost blade). Flowers one to three (commonly two), rather small for the genus, pink, about 5 cm. or less apart, subtended by a strict lanceolate bract which is similar to the leaves but shorter and often slightly broader. Mature ovary cylindric, about 4.5 cm. long. Dorsal sepal lanceolate-oblong, acute, about 3.6 cm. long, 7.5–8 mm. wide. Lateral sepals similar to the dorsal sepal, narrowly elliptic-oblong or lanceolate-oblong, acute and minutely apiculate, lightly oblique, about 3.4 cm. long, 6.2–7.2 mm. wide. Petals oblong-elliptic or narrowly obovate-oblong, subacute, with irregular anterior margins, about 3.3 cm. long, 1.1–1.3 cm. wide. Lip sharply 3-lobed near the apex, elliptic-ovate or oblong-ovate in outline, rounded at base with a minute gland on each side within, about 3.3 cm. long, 1.35–1.6 cm. wide near or above the middle; lower portion relatively large, ovate-oblong or subquadrate-oblong, terminating on each side in a triangular spreading subacute apex; mid-lobe relatively small, suborbicular-obovate, retuse or rounded at the apex, with irregularly erose-dentate margins, 6–7.5 mm. long, about 7 mm. wide; disc with a broad band of more or less papillose ridges extending from the base nearly to the apex and narrowing above to a point. Column including the rigidly attached anther about 2.25 cm. high at the back, linear-oblong and sulcate when viewed from the front.

This species is apparently similar to several Brazilian Pogonias of Section *Cleistes*, especially to *Pogonia revoluta* Rodr., which has much broader leaves, and flowers about twice as large. The flowers seem to be quite like

those of *P. fragrans* Schltr., but they are fewer in number and are scarcely more than half as large.

Cuzco: Prov. of Convención, Sahuayaco-Cascarillayocc, at 1700 meters altitude, on grassy slopes, January 17, 1947, *C. Vargas 6306* (Type in Herb. Ames No. 63446); Prov. of Urubamba, Tuncapata, Sta. Rita, on open grassy slopes, at 2500 meters altitude, March 28, 1942, *C. Vargas 2686*.

Puno: Prov. of Sandia, Sto. Domingo area, at 1550 meters altitude, flowers red tinged with blue and having slight agreeable odor, February 12, 1940, *D. McCarroll 102*. The flowers in this collection are apparently in bud and are notably smaller than normal.

Altensteinia elliptica *C. Schweinfurth sp. nov.*

Herba parva, saxicola. Folia plura, prope caulis basim rosulata, oblongo-elliptica, acuta vel subacuta. Caulis vaginis pluribus laxis imbricatis tectus. Racemus dense multiflorus. Flores parvi, labello excepto membranacei. Sepala petalaque patentia vel reflexa. Sepalum dorsale elliptico-lanceolatum, subacutum vel obtusum, dorso pubescens. Sepala lateralia similia, oblique elliptico-lanceolata, complicato-acuta. Petala oblanceolato-linearia, obliqua, subacuta, subglabra. Labellum carnosum, erectum, tubulari-concavum, vi explanatum suborbiculare, dorso minute pustulatum. Columna clavata.

Plant low, about 16 cm. high. Roots fascicled, tuberous, short, numerous. Leaves four or five, clustered near the base and surrounded by several imbricating sheaths, oblong-elliptic, acute or subacute, narrowed to a broad sheathing base, up to about 8.5 cm. long and 2 cm. wide. Stem up to the inflorescence about 10.5 cm. high, entirely concealed by several loose imbricating sheaths. Inflorescence racemose, densely many-flowered, with the rachis lanuginose. Floral bracts ovate, acute or acuminate, concave, scarious, sparingly ciliate, shorter than the flowers. Flowers small, whitish green, membranaceous except the lip. Dorsal sepal elliptic-lanceolate, subacute to obtuse, dorsally pubescent, 1-nerved with

two short lateral nerves, about 7.5 mm. long and 2.9 mm. wide. Lateral sepals similar, obliquely elliptic-lanceolate, complicate-acute, 2-nerved. Petals obliquely oblanceolate-linear, subacute, glabrous or very sparingly ciliate, 1-nerved, about 7.5 mm. long and 1 mm. wide. Lip fleshy, erect, tubular-concave, simple, about 10 mm. long, about 10 mm. wide when forcibly expanded, broadly rounded, minutely erose-fimbriate, dorsally minutely pustulose. Column clavate from a slender base, about 5.5 mm. high. Ovary densely pubescent.

This species appears to be allied to *Altensteinia longispicata* C. Schweinf., but differs markedly in its small, relatively dwarf stature, short oblong-elliptic leaves and glabrous petals.

APURIMAC: Prov. of Grau, slopes of Seccsecka, on rocks at 3850 meters altitude, March 4, 1946, *C. Vargas 5771* (TYPE in Herb. Ames No. 63139).

Cranichis calva (*Kränzl.*) *Schlechter* var. **Vargasii** *C. Schweinfurth var. nov.*

Herba speciei typicae simillima sed sepalis minoribus atque petalis valde latioribus obovato-spathulatis differt.

Plant about 31 cm. tall. Basal leaves one or two, long-petioled; lamina obliquely elliptic or ovate-elliptic, acute, broadly cuneate below, up to 9 cm. long and 3.6 cm. wide. Stem glabrous. Peduncle about 20 cm. high, provided below with two remote small elliptic leaves and above with a small narrow bract. Raceme about 10 cm. long, rather densely many-flowered. Flowers whitish yellow, somewhat smaller than in the typical plant. Dorsal sepal lanceolate-elliptic, concave, obtuse or subacute, about 3.7 mm. long. Lateral sepals obliquely ovate, subacute or obtuse, about 3.9 mm. long and 2.8 mm. wide. Petals spatulate-obovate, broadly rounded at the apex, about 3.2 mm. long and 1.75 mm. wide. Lip similar to that of the type, deeply concave, condu-

plicate in the dried plant when seen from the side, about 3.5–3.8 mm. long.

This concept differs from the type in having somewhat smaller flowers, relatively broader lateral sepals and very dissimilar petals.

Cuzco: Prov. of Convención, Hda. Potrero, Sapan Sachayocc at 2200 meters altitude, in humus of dense forest, March 5, 1942, *C. Vargas 2558* (Type in Herb. Ames No. 65623).

Ponthieva bicornuta *C. Schweinfurth sp. nov.*

Herba terrestris, pro genere major. Folia maxima pro parte basalia, rosulata, elliptica vel anguste obovata, acuta, basi in petiolum sulcatum sensim angustata. Pedunculus elatus. Racemus laxe multiflorus. Flores mediocres, albi et virides. Sepalum dorsale ellipticum, subacutum. Sepala lateralia majora, oblique oblongo-ovata, obtusa, margine anteriore late rotundato. Petala columnae adnata, oblongo-semihastata, obtusa, anguste unguiculata. Labelli unguis a latere visus semiorbicularis, antice bicornutus, columnae adnatus; lamina erecta, concavo-conduplicata, expansa in circuitu ovato-subquadrata, apice trilobata, cum lobo terminali parvo, orbiculari-obovato. Columna crassa.

Plant terrestrial, suberect, about 48 cm. or less high. Roots fibrous, lanuginose. Leaves three or four, mostly rosulate and subbasal; basal leaves three, elliptic to narrowly obovate, acute or short-acuminate, more or less gradually narrowed into sulcate basally imbricating petioles, about 18 cm. or less long including the petiole, 1.2–3.2 cm. wide; leaf above the basal cluster much smaller than the others, lanceolate-elliptic, acute, with a long sheathing base. Peduncle about 24–27.5 cm. long from the basal cluster of leaves up to the raceme, glabrous below, glandular-pubescent above, provided with three to five close sheaths which are larger and tubular below and sessile near the inflorescence. Raceme loosely

many-flowered, with the densely glandular-pubescent rachis about 14–20 cm. long. Floral bracts ovate-lanceolate, much shorter than the pedicellate ovary which they clasp, up to 9 mm. long. Pedicellate ovary very slender when young, clavate-ellipsoid in course of development. Flowers nearly glabrous, white with green outer surface of sepals and about seven green lines on inner surface of petals. Dorsal sepal elliptic, subacute, 3-nerved, about 6.3 mm. long and 2.7 mm. wide. Lateral sepals obliquely oblong-ovate, broadly rounded on the anterior margin, obtuse, about 7 mm. long across the posterior margin and 4 mm. wide, 4- to 5-nerved. Petals adnate to the lower third of the column, oblong-semihastate, obtuse, about 6 mm. long and 2.6 mm. wide across the round-dilated anterior part, about 4-nerved with the narrow cuneate claw about 1.75 mm. long. Lip adnate to the lower third of the column by a stout claw which is semicircular when viewed from the side, erect and parallel to the column; claw mostly occupied by a complanate semiorbicular callus and terminated by a pair of linear spreading gently recurved horns; lamina concave-conduplicate in natural position, when expanded ovate-subquadrate, subcordate at base, sharply 3-lobed in front with a small suborbicular-obovate apically concave lobule, about 4.8 mm. long and 4 mm. wide. Column stout, about 4 mm. high, terminating in a sharp erect process.

This species appears to be allied to *Ponthieva oligoneura* Schltr., but is much larger throughout. Furthermore, the pair of linear horns at the apex of the claw of the lip is extraordinary.

Junín: Prov. of Tarma, Agua Dulce, at 2400 meters altitude, in highland dwarf forest, "leaf very soft and weak, stem pale brown," March 12, 1948, *F. Woytkowski 35457* (Type in Herb. Ames No. 65450; Isotypes in Herb. Univ. Calif. and in Herb. Mo. Bot. Gard.).

Spiranthes Pavonii *Reichenbach filius* in Bonpl. 4 (1856) 211.

Spiranthes matucanensis Kränzlin in Engler Bot. Jahrb. 54 (1916) Beibl. 117, p. 16.

Spiranthes pachyrhiza Kränzlin in Engler Bot. Jahrb. 54 (1916) Beibl. 117, p. 16.

Pelexia matucanensis Schlechter in Beih. Bot. Centralbl. 37 (1920) Abt. 2, p. 410.

Sarcoglottis Pavonii Schlechter in Beih. Bot. Centralbl. 37 (1920) Abt. 2, p. 419.

Judging from the excellent description of *Spiranthes Pavonii* (l.c.), supplemented by analytical drawings of this concept from the Reichenbach Herbarium in Vienna, it is evident that we should include in this variable species the plants described as *Spiranthes matucanensis* and *S. pachyrhiza* which were considered to be synonymous by Schlechter (in Beih. Bot. Centralbl. 37 (1920) Abt. 2, p. 410).

The analytical drawing of *Spiranthes Pavonii* shows a short compact raceme (of somewhat immature flowers) which is almost an exact counterpart of the inflorescence of *S. pachyrhiza* as exemplified by the two isotypes examined. *S. matucanensis* is shown by a photograph of the type in the Ames Herbarium to have a rather loose and relatively elongate raceme due to the fact that the flowers appear to be somewhat advanced by reason of their swollen ovaries. It is interesting to note in this connection that the spike of *S. Pavonii* is described as at first quaquaversal and then secund in anthesis.

A further detail of similarity is that all of these concepts actually have petals with a subacute or abruptly acute apex, although in both *S. matucanensis* and *S. pachyrhiza* the petals were described as obtuse.

Spiranthes Weberbaueri *Kränzl.* var. **aurantiaca** *C. Schweinfurth var. nov.*

Herba variabilis, floribus aurantiacis (non viridibus), labelli apice maxima pro parte late rotundato (non retuso) atque columna antice glabra (non longe pilosa) a specie differt.

Plant variabile, slender or stout, 15–75 cm. tall. Leaves usually present, basal, rosulate, more or less distinctly petioled; lamina narrowly oblong to elliptic, more or less acute, about 18 cm. or less long, up to 3.6 cm. wide. Stem finely pubescent especially above (rarely subglabrous below), with several tubular membranaceous sheaths. Raceme short to elongate, several- (10) to many-flowered, with orange to dull brick-red flowers. Pedicellate ovary and sepals densely glandular-pubescent without. Dorsal sepal oblanceolate-linear, acute at the lightly cucullate apex, about 1.2–1.6 cm. long, 2.4–3.5 mm. wide above. Lateral sepals connate into a subgibbous sac below, with the recurved free portion obliquely linear-oblanceolate and about as long as the dorsal sepal but narrower. Petals strongly adnate to the dorsal sepal and somewhat smaller, narrowly spatulate-oblanceolate, acute to rounded at the apex. Lip strongly adnate to the column nearly up to its apex, about 1.3–2 cm. long and 5.5–7 mm. wide above, from the linear channelled basal portion, which is callose-thickened on each side of the somewhat broader base, dilated into an obovate apex traversed by a thickened mid-nerve, the upper portion being reflexed, broadly rounded and irregularly crenate-dentate. Column slender, glabrous, lightly arcuate above, extended into a prominent foot, the free part about 7.5–12 mm. long.

Cuzco: Crapeza Valley, Piquillacta, at 3150 meters altitude, November 3, 1928, *F. L. Herrera 2181;* Ollantaytambo, in a canyon, at about 3000 meters altitude, flowers antimony yellow, April 24, 1915, *O. F. Cook & G. B. Gilbert 281;* Prov. of Cuzco, Pisac, on gravelly slopes, at 3100 meters altitude, perianth orange, November 8, 1942, *C. Vargas 2983;* Prov. of Urubamba, Piri, at 2800 meters

altitude, on heath-covered slopes, perianth orange, March 22, 1946, *C. Vargas 5935* (TYPE in Herb. Ames No. 63451).

HUÁNUCO: Huacachi, near Muña, at edge of shady thicket, at about 2000 meters altitude, May 20–June 1, 1923, *J. Francis Macbride 4076* (the flowers of this collection are small).

The following collection, tentatively identified as this variety, which is vegetatively incomplete and has small flowers, bears the accompanying data:

APURIMAC: near Soccllaccasa Pass, at 3700 meters altitude, in grass and among rocks in full sun, "average 40 cm. high; dull apricot-yellow flower, brown pencilling; tuberous roots," November 10, 1935, *James West 3824*.

Stelis affinis *C. Schweinfurth sp. nov.*

Herba pusilla, caespitosa vel breviter rhizomatosa, saxicola. Caules aggregati, numerosi, graciles, vaginis tubulatis tribus ornati. Folium erectum, inconspicue petiolatum; lamina anguste elliptica vel oblongo-oblanceolata, acuta, infra sensim cuneata, chartacea. Racemi singuli vel tres, folium conspicue superantes, multiflori, super densiflori. Flores perparvi, membranacei. Sepala trinervia. Sepalum dorsale ovatum, acutum. Sepala lateralia paulo breviora et latiora, suborbiculari-ovata, leviter obliqua. Petala multo minora, transverse ovalia, supra incrassata et late rotundata. Labellum petalis circiter aequilongum sed angustius, transverse ovatum, apice late rotundatum; discus carina transversa bilobata ornatus. Columna generis.

Plant small, slender, caespitose or with an abbreviated rhizome, growing on cliffs. Roots fibrous, filiform, glabrous, very numerous. Stems crowded, short, slender, up to 6 cm. long, concealed by about three close tubular evanescent sheaths which become longer upward. Leaf erect or spreading, inconspicuously petioled, 3.1–4.4 cm. long; lamina narrowly elliptic or oblong-oblanceolate, acute with a minutely tridenticulate apex, gradually cu-

neate below, marginate, chartaceous, with the mid-nerve prominently exserted beneath, about 2.3–3.8 cm. long and 6–9 mm. wide. Racemes one to three, erect or nearly so, conspicuously surpassing the leaf, up to 10 cm. long, many-flowered, densely flowered above. Floral bracts small, shallowly infundibuliform, acute or apiculate. Flowers very small, membranaceous, dull yellow, glabrous. Sepals connate at the base, prominently 3-nerved. Dorsal sepal ovate, acute, about 2.5 mm. long and 1.5 mm. wide. Lateral sepals suborbicular-ovate, lightly oblique, subacute, about 2.1 mm. long and 1.75 mm. wide. Petals much smaller, transversely oval, broadly rounded and fleshy-thickened above, 3-nerved, about 0.5 mm. long and 1 mm. wide. Lip about equally long with the petals, transversely ovate, subcordate on each side of the sessile base, broadly rounded in front, about 0.5 mm. or more long and 0.75 mm. wide; disc with a prominent fleshy transverse bilobed keel near the base. Column minute, characteristic of the genus.

This species resembles the Central American *Stelis parvula* Lindl., but differs in having less conspicuous floral bracts, a narrower dorsal sepal and a smaller lip.

PUNO: Prov. of Carabaya, Ollachea (abajo), at 2500 meters altitude, December 30, 1947, *C. Vargas 6947* (TYPE in Herb. Ames No. 65205).

Stelis ascensor *C. Schweinfurth sp. nov.*

Herba mediocris, rhizomatosa. Rhizoma adscendens, vaginis tubulatis obtectum. Caules graciles, valde adscendentes, vaginis tubulatis tribus tecti. Folium petiolatum; lamina saepissime anguste elliptico-oblonga, apice acuta, infra cuneata; petiolus gracilis. Racemi unici (raro bini), folium multo superantes, subdense multiflori. Flores parvi, bilabiati, membranacei. Sepala trinervia. Sepalum dorsale elliptico-ovatum, subacutum. Sepala

lateralia profunde connata, quam sepalum dorsale breviora et latiora, suborbiculari-ovata. Petala multo minora, transverse ovalia, apice leviter incrassata et late rotundata. Labellum petalis subaequale, late triangulari-ovatum, incrassatum. Columna generis.

Plant medium-sized, slender. Roots fibrous, filiform, glabrous, long. Rhizome ascending, slender, concealed by tubular evanescent sheaths, bearing remote scattered roots throughout. Stems strongly ascending, subapproximate to 1.5 cm. apart, slender, about 7.6–9 cm. long, with three rather loose tubular sheaths of which the uppermost is largest and separated from the others. Leaf solitary, petioled, up to 9.4 cm. long; lamina narrowly elliptic-oblong (rarely oblong), 6–8 cm. long, 9–13 mm. wide, acute with a minutely tridenticulate apex, cuneate below, chartaceous, with the mid-nerve rather prominently exserted beneath. Racemes solitary or rarely two, much surpassing the leaf, subdensely many-flowered (looser below), suberect to flexuous, with the flowers secund in anthesis, about 13–17 cm. long. Floral bracts small, infundibuliform, spreading, acute or apiculate. Flowers small, membranaceous, bilabiate, glabrous. Sepals 3-nerved, connate at base. Dorsal sepal elliptic-ovate, subacute, concave, about 3.5 mm. long and 2.25 mm. wide when expanded. Lateral sepals connate to the middle or above, deeply concave, suborbicular-ovate, slightly oblique, subacute to obtuse, about 2.75 mm. long and 2.5 mm. wide when expanded. Petals much smaller than the sepals, transversely oval, 3-nerved, broadly rounded and somewhat fleshy-thickened above, about 0.6 mm. long and 1 mm. or more wide. Lip subequaling the petals, broadly triangular-ovate, concave, subacute or obtuse, truncate-subcordate at base, about 0.75 mm. long and 1 mm. wide; disc mostly occupied by a fleshy thickening which is highest and convex (in profile) in the

center at the base. Column very small, dilated upward, characteristic of the genus.

This species appears to lack any close allies.

Cuzco: Prov. of Quispicanchis, Hda. Itío, Marcapata, at 2000 meters altitude, in sunny rocky places, flowers yellow-brown, January 27, 1943, *C. Vargas 3115* (Type in Herb. Ames No. 65215).

Stelis attenuata *Lindley* Fol. Orch. Stelis (1858) 2, no. 7.

Stelis Lindleyana Cogn. var. *carnosior* C. Schweinfurth in Bot. Mus. Leafl. Harvard Univ. 10 (1942) 120.

On restudying this group, it appears more advisable to consider the concept described as *Stelis Lindleyana* var. *carnosior* as a form of *S. attenuata.* The collection *Killip & Smith 24753* has markedly longer leaves than *S. attenuata;* the incomplete racemes are shorter than in the type, and, like the collection *Killip & Smith 23150*, which is also assigned to this species, has greenish instead of purple flowers.

Stelis breviracema *C. Schweinfurth sp. nov.*

Herba mediocris, epiphytica, subcaespitosa. Rhizoma breve ut videtur. Caules approximati, pergraciles, unifoliati, vaginis arctissimis tubulatis tecti. Folium longe petiolatum; lamina anguste elliptica, acuta, infra cuneata; petiolus gracilis. Racemi bini, quam folium breviores, laxe pluri- vel multiflori. Flores parvi, glabri, membranacei. Sepala basi connata, ovata, trinervia; sepalum dorsale acutum; sepala lateralia rotundato-ovata, paulo breviora et latiora, obtusa vel subacuta. Petala multo minora, rhombica, apice valde carnosa, uninervia. Labellum petalis subaequale, ovatum, apice obtusum vel rotundatum, basi cordatum; discus callo carnoso sulcato occupatus. Columna parva, supra dilatata.

Plant medium-sized, epiphytic, subcaespitose, about

18.5 cm. or less high. Roots fibrous, filiform, glabrous, very numerous. Rhizome abbreviated (incomplete in our specimen). Stems caespitose, slender, 1-leaved at the apex, about 4.7–9.5 cm. long, provided with two or three very close tubular sheaths of which the uppermost is elongate and separated from the other sheaths. Leaf erect-ascending, long-petioled, 5.7–10.3 cm. long; lamina narrowly elliptic, acute with a sharply tridenticulate apex, cuneate below, chartaceous, long-petioled, about 4.5–7 cm. long, 9–15 mm. wide; petiole slender, channelled, up to 2.5 cm. long. Racemes apparently always two to each stem, axillary, more or less shorter than the leaf, erect to diffuse, loosely several- to many-flowered, about 8.6 cm. or less long, subtended by a long slender long-acuminate spathe. Floral bracts small, infundibuliform, acute or apiculate. Flowers small, glabrous, membranaceous. Sepals connate near the base, concave, 3-nerved. Dorsal sepal elliptic-ovate, acute, about 3 mm. long and 1.6–1.9 mm. wide. Lateral sepals round-ovate, obtuse to subacute, about 2.5 mm. long and 1.75–2 mm. wide. Petals much smaller than the sepals, rhombic, fleshy-thickened above, strongly obtuse or rounded, about 0.75 mm. long and subequally wide, 1-nerved. Lip about equaling the petals, ovate, cordate at base, rounded at the apex, about 0.75–0.9 mm. long and 0.6–0.75 mm. wide; disc mostly occupied by a large fleshy sulcate thickening. Column small, dilated above, a little shorter than the petals.

This species is apparently allied to the Venezuelan *Stelis philargyrus* Reichb.f., but lacks the apiculate sepals and tridentate lip of that species.

Cuzco: Prov. of Paucartambo, "laderas de Pillahuata, ceja de la montaña," at 3000 meters altitude, epiphytic in rain-forest, perianth yellow, October 12, 1943, *C. Vargas 3665* (Type in Herb. Ames No. 65208).

Stelis curvicarina *C. Schweinfurth sp. nov.*

Herba mediocris, caespitosa, gracilis. Caules approximati, graciles, vaginis tubulatis tribus obtecti. Folium unicum, suberectum, petiolatum; lamina anguste oblonga vel elliptico-oblonga, subacuta, basi cuneata, coriacea. Racemi unici vel bini, folium valde superantes, erecti vel suberecti, dense vel subdense multiflori. Flores parvi, distichi, bilabiati. Sepala trinervia, membranacea. Sepalum dorsale elliptico-ovatum, subacutum. Sepala lateralia plusminusve connata, oblique suborbiculari-ovata, sepalo dorsali multo breviora, valde concava. Petala multo minora, transversa, semiorbiculari-ovata, antice incrassata et late rotundata. Labellum in circuitu suborbiculari-ovatum, leviter trilobatum, apice rotundatum; lobi laterales parvi, semiobovati; lobus medius comparate magnus, suborbicularis; discus prope basim cum carina transversa arcuata. Columna minuta.

Plant medium-sized, slender, caespitose, up to 27.5 cm. tall. Roots fibrous, filiform, glabrous. Stems approximate, slender, about 6 cm. long (sterile stems shorter) concealed by three close tubular evanescent sheaths of which the uppermost is much the longest. Leaf solitary, erect or ascending, shortly petioled, about 7 cm. long; lamina narrowly oblong or elliptic-oblong, subacute with a minutely tridenticulate apex, cuneate below, up to 5.8 cm. long and 1 cm. wide, coriaceous, with the mid-nerve more or less exserted beneath. Racemes one or two, much surpassing the leaf, erect or suberect, densely or subdensely many-flowered (looser near the base), up to 20 cm. long. Floral bracts small, shallowly infundibuliform, spreading, obtuse and apiculate. Flowers small, distichous, bilabiate, glabrous, with widely spreading sepals. Sepals 3-nerved, membranaceous. Dorsal sepal elliptic-ovate, subacute, lightly concave, somewhat connate with the lateral sepals at the

base, about 3.9 mm. long and 2.25 mm. wide. Lateral sepals more or less connate (from one half nearly to the apex), deeply concave, very obliquely suborbicular-ovate with broadly rounded outer margins and nearly straight inner margins, subacute to obtuse, about 3 mm. long and 2 mm. or more wide when expanded. Petals much smaller than the sepals, transverse, semiorbicular-ovate, broadly rounded and fleshy-thickened above, lightly 3-nerved, about 0.6 mm. long and 0.75 mm. wide. Lip slightly longer than the petals, suborbicular-ovate in outline, broadly rounded in front, obscurely 3-lobed near the base, broadly cuneate at the sessile base when viewed from above, with the basal portion membranaceous and the anterior part rather fleshy, about 0.87 mm. long and subequally wide across the dilated basal portion; anterior portion suborbicular, concave; disc with a transverse fleshy arching keel separating the large anterior part from the suborbicular basal dilation. Column minute, strongly dilated upward, deeply 3-lobed above.

This species is somewhat allied to *Stelis velutina* Lindl., but the sepals are smooth within and the lip is differently proportioned.

Cuzco: Prov. of Urubamba, Machupicchu, on rocks at 2100 meters altitude, flowers apparently yellowish, April 15, 1943, *C. Vargas 3343* (Type in Herb. Ames No. 65212).

Stelis dupliciformis *C. Schweinfurth sp. nov.*

Herba mediocris, epiphytica. Rhizoma conspicuum, vaginis tubulatis arcte obtectum. Caules bini ut videtur, vaginis duabus vel tribus ornati. Folium longe petiolatum; lamina lanceolato-elliptica, subacuta, infra valde cuneata. Racemi saepissime bini, folio breviores vel hunc paulo excedentes, supra dense multiflori. Flores pro genere magni, bilabiati. Sepalum dorsale ovatum, acutum, infra quinquenervium. Sepala lateralia in laminam valde concavam connata, quae sepalo dorsali paulo bre-

vior et latior, sepalum utrinque suborbiculari-ovatum. Petala multo minora, transverse rhombico-ovata, apice late rotundata et carnosa. Labellum petalis subaequale, ovatum, obtusum; discus callo transverso bilobato valde incrassato occupatus. Columna generis.

Plant medium-sized, epiphytic. Roots fibrous, filiform, glabrous, numerous. Rhizome prominent, concealed by close tubular imbricating sheaths. Stems obliquely ascending, produced from the rhizome in pairs apparently about 3 cm. apart in our specimen, about 12–14 cm. long, clothed with two or three tubular sheaths of which the uppermost is looser and much the largest. Leaf solitary, long-petioled, 10.6–13 cm. long, erect-ascending; lamina lanceolate-elliptic, subacute with a minutely tridenticulate apex, gradually cuneate below, chartaceous, with the mid-nerve prominently exserted beneath, about 8.5–10 cm. long and 2–3 cm. wide. Racemes two to each stem (rarely a short third one is present), shorter than or very slightly surpassing the leaf, suberect or spreading, many-flowered, densely flowered above and loosely flowered below, up to 15 cm. long, subtended by an inconspicuous conduplicate scarious spathe about 1.2 cm. long. Floral bracts shallowly infundibuliform, apiculate, widespreading. Flowers rather large for the genus, secund in anthesis, conspicuously bilabiate, dull reddish white. Sepals membranaceous, minutely cellular-pubescent within. Dorsal sepal ovate, acute, convex, shortly connate with the lateral sepals at the base, 3-nerved above and 5-nerved below the middle, about 6.1 mm. long, 3.5–4 mm. wide. Lateral sepals connate nearly to the apex into a deeply concave lamina, each one suborbicular-ovate, subacute, lightly oblique, 3- to 4-nerved, about 5.2 mm. long and 4.3 mm. wide. Petals much smaller, transversely rhombic-ovate, broadly rounded and fleshy-thickened above, 3-nerved, about 1.75

mm. long and 2 mm. wide. Lip subequaling the petals, ovate to rhombic-ovate, obtuse, with upcurved sides, about 1.25 mm. long and equally wide in natural position; disc mostly occupied by a large transverse fleshy deeply bilobed callus. Column minute, strongly dilated upward.

This species appears to be allied to *Stelis flacca* Reichb.f., but differs in having a prominent rhizome and a dissimilar lip.

Cuzco: Prov. of Quispicanchis, Cachubamba, Marcapata, at 2800 meters altitude, epiphyte in forest, December 12, 1943, *C. Vargas 3816* (Type in Herb. Ames No. 65251).

Stelis gracilispica *C. Schweinfurth sp. nov.*

Herba mediocris, gracilis, caespitosa. Caules numerosi, approximati, vaginis duabus vel quattuor tubulatis arctis tecti. Folium unicum, erectum, conspicue petiolatum; lamina elliptico-oblonga, acuta vel obtusa, infra cuneata. Racemi unici vel duo, folium saepissime valde superantes, dense multiflori. Flores perparvi, bilabiati, secundi, submembranacei. Sepala trinervia. Sepalum dorsale elliptico-ovatum, subacutum vel obtusum. Sepala lateralia in laminam valde concavam bidentatam connata, cum sepalo utroque quam sepalo dorsali paulo minore. Petala multo minora, transverse rhombico-suborbicularia. Labellum petalis minus, transverse obovato-rhombicum, callo transverso carnoso bilobato ornatum. Columna generis.

Plant medium-sized, slender, caespitose, about 23 cm. or less high. Roots fibrous, filiform, glabrous, very numerous. Stems numerous, approximate, suberect, slender, about 4–9 cm. high, clothed with two to four sheaths which are close tubular and maculate, the uppermost being separated and much the longest. Leaf solitary, erect, distinctly petioled, 6–7.2 cm. long; lamina elliptic-oblong (often narrowly so), acute to obtuse or rounded with a minutely tridenticulate apex, cuneate at base,

coriaceous, with the mid-nerve prominently exserted beneath, 3.8-5.7 cm. long, up to 1.2 cm. wide; petiole slender, channelled. Racemes one or two to a stem, erect or nearly so, usually much surpassing the leaf, slender, densely many-flowered, up to 18 cm. long. Flowers very small, strongly secund, yellow, submembranaceous, bilabiate, nodding. Dorsal sepal elliptic-ovate, subacute to obtuse, 3-nerved, lightly convex, shortly connate with the lateral sepals at the base, about 3 mm. long and 2 mm. wide. Lateral sepals connate into a deeply concave lamina which is bidentate at the tip; each sepal oval-ovate, subacute, 3-nerved, lightly oblique, about 2.25 mm. long and 1.75 mm. wide. Petals many times smaller than the sepals, transversely rhombic-suborbicular, broadly rounded at the apex, fleshy-thickened upward, concave, 3-nerved, about 0.6 mm. long and 1 mm. or more wide. Lip smaller than the petals, transversely obovate-rhombic, concave, obtuse, provided above the middle with a fleshy transverse bilobed callus, about 0.56 mm. long and 0.7 mm. wide. Column minute, strongly dilated upward.

This species is allied to the Central American *Stelis despectans* Schltr., but varies in having a very different lip.

Huánuco: Carpish between Huánuco and Tingo María, at 2500–2800 meters altitude, March 2, 1947, *Ramón Ferreyra 1748* (Type in Herb. Ames No. 65281).

Stelis Hallii *Lindl.* var. **minor** *C. Schweinfurth var. nov.*

Herba caespitosa, pusilla, statura omnino minore et racemo non valde fractiflexo et petalis non trilobulatis a specie differt.

Plant caespitose, small, up to 9.5 cm. high. Stems crowded, abbreviated, about 3.5 cm. or less tall, entirely concealed by two or three close tubular imbricating

sheaths. Leaf oblanceolate or elliptic-oblanceolate, acute with a minutely tridenticulate apex, gradually long-narrowed into an indistinct petiole, up to 3.7 cm. long and 8 mm. wide. Inflorescences one or two to each stem, nearly twice as long as the leaf, loosely several-flowered, without a markedly fractiflex rachis. Flowers very small, pale green with a reddish flush. Sepals 3-nerved. Dorsal sepal round-ovate, about 2.5 mm. long and slightly broader. Lateral sepals distinctly smaller, oblique. Petals minute, transversely rhombic-semiorbicular, entire at the broadly rounded much-thickened apex. Lip slightly smaller than the petals, transversely rhombic-ovate, with a fleshy transverse callus across the middle, subobtuse at the broad apex, about 0.8 mm. long and 1 mm. wide.

JUNÍN: Prov. of Tarma, Utcuyacu, at 1800 meters altitude, on moss-covered rocks in forest, leaf thick, April 2, 1948, *F. Woytkowski 37004* (TYPE in Herb. Univ. Calif.; ISOTYPES in Herb. Ames and in Herb. Mo. Bot. Gard.).

Stelis punoensis *C. Schweinfurth sp. nov.*

Herba mediocris, saxicola. Rhizoma conspicuum, adscendens, crassum. Caules saepe bini, vaginis tubulatis tribus ornati. Folium plusminusve distincte petiolatum; lamina oblanceolata (raro elliptica), acuta, infra sensim cuneata. Racemi unici vel tres, maxima pro parte folium excedentes, laxe vel subdense pluri- vel multiflori. Flores comparate magni, purpurei ut videtur. Sepala trinervia. Sepalum dorsale ovatum vel elliptico-ovatum. Sepala lateralia multo breviora et latiora, plusminusve connata, suborbiculari-ovata. Petala multo minora, suborbicularia, supra valde carnosa. Labellum petalis minus, ovatum, obtusum; discus crassitudine basi bilobata antice concava occupatus. Columna perbrevis, sursum dilatata, apice lobo medio comparate magno.

Plant medium-sized, up to 26.5 cm. or more tall. Roots fibrous, filiform, glabrous, numerous. Rhizome

prominent, stout, ascending, closely enveloped by evanescent sheaths. Stems apparently in pairs, with a more or less decumbent base, 1-leaved at the apex, 3–13.5 cm. long, adorned with three tubular evanescent sheaths of which the uppermost is the largest. Leaf erect or ascending, more or less distinctly petioled, 4.7–9.6 cm. long, lamina oblanceolate (rarely elliptic), acute with a minutely tridenticulate apex, gradually narrowed below into a petioled base, about 3.5 8 cm. long, up to 1.8 cm. wide, coriaceous. Racemes one to three, longer or rarely slightly shorter than the leaf, erect or suberect, loosely to subdensely several- to many-flowered, about 15.5 cm. or less high, sometimes with a fractiflex rachis, subtended by a conduplicate acuminate spathe up to 1.7 cm. long. Floral bracts small, infundibuliform, acute, spreading. Flowers relatively large for the genus, apparently purplish. Sepals 3-nerved, submembranaceous, ciliate and very minutely pubescent within. Dorsal sepal shortly connate with the lateral sepals at the base, ovate or elliptic-ovate, subacute, about 6.9 mm. long and 4.1 mm. wide. Lateral sepals more or less deeply connate, obliquely suborbicular-ovate, obtuse to subacute, about 5.1 mm. long and 4.9 mm. wide. Petals much smaller than the sepals, suborbicular, broadly rounded to obtuse at the apex, 3-nerved, fleshy-thickened above, about 1.3 mm. long and 1.75 mm. wide. Lip very fleshy, smaller than the petals, ovate, truncate at base, with subcordate erect sides, obtuse, about 1 mm. long and 1 mm. wide in natural position; disc filled with a fleshy thickening which is bilobed near the base and concave toward the front. Column very short and fleshy, dilated upward, 3-lobed with a large ovate-triangular mid-lobe.

This species outwardly simulates the Peruvian *Stelis densiflora* Lindl., but lacks the 5-nerved sepals and triangular apex to the lip. It differs from the Bolivian *S.*

campanulifera Lindl. in having much larger flowers with more ovate sepals and a dissimilar lip.

PUNO: Prov. of Carabaya, between Ollachea and Pte. Ackopampa, at 3200 meters altitude, on cliffs, December 31, 1947, *C. Vargas 6981* (TYPE in Herb. Ames No. 65207).

Stelis rhombilabia *C. Schweinfurth sp. nov.*

Herba major, saxicola. Caules approximati, duo vel tres ut videtur, vaginis duabus vel tribus tubulatis conspicuis tecti. Folium unicum, conspicue petiolatum; lamina elliptica vel oblongo-ovata, obtusa vel subacuta, basi late cuneata vel subrotundata. Racemi tres vel quattuor, folium multo excedentes, dense multiflori. Flores parvi, secundi ut videtur, valde bilabiati. Sepala trinervia, intus dense breviter pubescentia. Sepalum dorsale ovatum, breviter acuminatum. Sepala lateralia in laminam valde concavam suborbiculari-ovatam omnino connata. Petala multo minora, concava, suborbicularia, supra late rotundata et incrassata. Labellum sepalis subaequale, ovato-rhombicum; discus maxima pro parte callo carnoso arcuato occupatus.

Plant rather large, 30 cm. or more tall. Roots fibrous, filiform, glabrous, very numerous. Rhizome missing in our specimen. Stems approximate, in pairs or threes, about 13–19 cm. long, clothed with two or three loose tubular sheaths of which the uppermost and much the largest is sometimes produced into an imperfect leaf-blade. Leaf solitary, erect, petioled, 11.7–14.8 cm. long; lamina elliptic or oblong-ovate, obtuse or subacute with a minutely tridenticulate apex, shortly cuneate to subrounded at the base, chartaceous, many-nerved, about 10–12.6 cm. long, 3.7–5 cm. wide; petiole prominent, sulcate, about 2.2 cm. or less long. Racemes three or four, much surpassing the leaf, suberect, densely many-flowered (loose at the base), 17.7–30.2 cm. long, subtended by a narrow acute spathe about 1.5 cm. long.

Floral bracts very small, shallowly infundibuliform, spreading, apiculate. Flowers small, apparently secund, strongly bilabiate, ringent. Sepals 3-nerved, tubular-concave, densely short-pubescent within. Dorsal sepal ovate, short-acuminate, rather fleshy, very shortly connate at base with the lateral sepals, about 4 mm. long and 2 mm. wide when expanded. Lateral sepals entirely connate into a suborbicular-ovate deeply concave lamina which is 6-nerved, bicarinate, about 3–3.4 mm. long, and 3 mm. or more wide when expanded, thinner than the dorsal sepal. Petals much smaller than the sepals, concave, suborbicular when expanded, fleshy-thickened and broadly rounded above, 3-nerved, produced into a subapical blunt horn on the outer surface, about 0.6 mm. long and 0.75 mm. wide. Lip subequaling the petals, ovate-rhombic, sessile, obtuse, broadly cuneate at the base, apparently lightly trilobulate in the middle but entire when spread out, about 0.6 mm. long and 0.75 mm. wide; disc with the entire central portion occupied by a very fleshy arched callus surrounding the concave apical part. Column minute, strongly dilated and trilobulate above.

This species differs from the Ecuadorian *Stelis nutans* Lindl. in having conspicuous cauline sheaths, spreading floral bracts and a dissimilar lip.

Cuzco: Prov. of Urubamba, between kil. 97 and 108, F.C.C., on rocks at 2200 meters altitude, flowers yellow, May 16, 1943, *C. Vargas 3413* (Type in Herb. Ames No. 65211).

Stelis triangulisepala *C. Schweinfurth sp. nov.*

Herba parva, caespitosa, epiphytica. Rhizoma abbreviatum. Caules filiformes, vaginis arcte tubulatis juvenitute obtecti. Folium unicum, erectum, inconspicue petiolatum; lamina anguste elliptico-oblonga vel oblanceolato-oblonga, subacuta, infra sensim angustata. Racemi singuli vel plures, erecti vel diffusi, folium plusminusve

superantes, laxe pluriflori. Bracteae conspicuae, atropurpureae. Flores pro planta magni, glabri, plani. Sepala late triangulari-ovata, obtusa vel subacuta, tri- vel quadrinervia. Petala multo minora, suborbiculari-ovata, valde carnosa. Labellum petalis minus, ovato-semiorbiculare, apice obtusum vel rotundatum, concavum, mediana cum carina transversa bilobata. Columna generis.

Plant small, caespitose, up to 12.3 cm. high to the tip of a raceme. Rhizome abbreviated. Roots fibrous, filiform, glabrous. Stems very slender, 1-leaved at the apex, about 3.6 cm. or less tall, concealed by three close tubular sheaths which are imbricating, dark or maculate and evanescent. Leaf erect, indistinctly petioled, 3.2–6.1 cm. long, 3.5–9 mm. wide; lamina elliptic-oblong or oblanceolate-oblong, minutely tridenticulate at the subacute apex, gradually cuneate below, chartaceous, up to 5.3 cm. long. Racemes axillary, one to nine, more or less surpassing the leaf, erect to arcuate or diffuse, loosely 4- to 13-flowered above, about 10 cm. or less long. Floral bracts infundibuliform, acuminate, widely spreading, apparently blackish purple. Flowers large for the plant, apparently flat, rounded-triangular in outline, pale greenish white, glabrous, with the sepals deeply connate below. Dorsal sepal triangular-ovate, obtuse or subacute, 3- or 4-nerved, about 4.1 mm. long and slightly wider near the base of the free portion. Lateral sepals closely similar to the dorsal sepal but slightly shorter, suboblique, 3- or 4-nerved, about 3.5 mm. long and 4.1 mm. wide across the free portion, strongly obtuse. Petals much smaller than the sepals, suborbicular-ovate, rounded above, 3-nerved, lightly cordate at base, with all except the basal part fleshy-thickened, about 1.3 mm. long and markedly wider below. Lip smaller than the petals, ovate-semiorbicular, obtuse to rounded at the apex, concave, with a prominent fleshy transverse bilobed callus

near the middle, about 0.75 mm. long and 1 mm. wide across the upcurved sides. Column characteristic of the genus, minute, apically 3-lobed with the mid-lobe much the largest.

This species is allied to *Stelis Hallii* Lindl., but lacks the fractiflex rachis of the raceme, the round-ovate sepals and the trilobulate petals of that concept. It is unusual in having very broad sepals which are sometimes 3-nerved and sometimes 4-nerved.

HUANCAVELICA: Prov. of Tayacaja, Ampurco woods, between Salcabamba and Surcubamba, epiphyte on mossy tree, at 2900 meters altitude, January 15, 1939, *H.E.Stork and O.B.Horton 10425* (TYPE in Herb. Field Mus. No. 1051159).

Stelis triseta *Lindl.* var. **pardipes** (*Reichb.f.*) *C. Schweinfurth comb. nov.*

Stelis pardipes Reichenbach filius Beitr. Orch. Centr.-Am. (1866) 96.

The species described as *Stelis triseta* from Bolivia, and lately detected in Peru, was noted as having proliferating stems; whereas the concept *Stelis pardipes*, described later from Costa Rica and also occurring in Peru, has almost uniformly simple stems. A photograph of the type collection of *S. triseta*, however, shows two plants, one proliferous and the other with simple stems. The Peruvian collections recently identified as this species have uniformly proliferous stems. On the other hand, three Costa Rican specimens of *S. pardipes* (*Standley 33180*, *33235*, *37751*) show proliferating stems.

Stelis triseta has acute or subacute leaves with an abruptly short-cuneate base. *S. pardipes*, a variable plant represented in the Ames Herbarium by a large number of collections, commonly has obtuse leaves with a gradually cuneate base and either strict or lax racemes. It may, however, have acute leaves.

The flowers of *Stelis triseta* appear to be an exact

match morphologically with those of *S. pardipes*, but differ in color. The Peruvian collections referred to *S. triseta* are noted as having white and dark pink or whitish yellow flowers, whereas those of *S. pardipes* are usually described as greenish wine-color, though rarely yellowish.

It seems apparent that these two concepts cannot be upheld as separate species. *Stelis triseta* is characterized by commonly proliferating stems, acute or subacute leaves that are short-cuneate at the base, and white and pink or whitish yellow flowers. The second concept, here designated as var. *pardipes*, has usually simple stems, obtuse leaves that are more or less gradually cuneate at the base, and flowers that are usually green or green and red to purple.

Another concept which is surely to be regarded as closely related to *Stelis triseta* is the Ecuadorian *Stelis pugiunculi* Lindl., distinguished by narrower linear or linear-lanceolate leaves and acute petals.

Stelis uninervia *C. Schweinfurth sp. nov.*

Herba mediocris, gracilis, saxicola. Rhizoma abbreviatum ut videtur. Caules caespitosi, gracillimi, vaginis tubulatis arctissimis obtecti, unifoliati. Folium breviter petiolatum; lamina anguste elliptico-oblonga, obtusa infra cuneata. Racemi numerosi, plusminusve stricti, subdense multiflori. Flores perparvi, membranacei, glabri. Sepala persimilia, ovata, acuta, conspicue uninervia. Petala multo minora, obovato-ovalia, subacuta, uninervia. Labellum petalis paulo majus, valde concavum, suborbiculari-ovatum, acutum. Columna comparate conspicua, e basi gracili valde clavato-dilatata.

Plant medium-sized, slender. Rhizome apparently abbreviated. Roots fibrous, filiform, glabrous, numerous. Stems caespitose, sometimes in pairs enveloped at the base by two or more imbricating scarious sheaths, very

slender, 1-leaved at the apex, 11.5–13.7 cm. long, with about three very close tubular sheaths of which the uppermost is elongate and separated from the others. Leaf erect-ascending, shortly petioled, about 9.3–10.3 cm. long; lamina narrowly elliptic-oblong, obtuse, shortly cuneate at the base, subcoriaceous, about 9 cm. long and 1.6 cm. wide. Racemes fascicled, strict or spreading, subequaling or surpassing the leaf, 14–16 in number, about 7.5–15 cm. long, subdensely many-flowered. Floral bracts inconspicuous, infundibuliform, acute, scarious, spreading. Flowers very small, either distichous or secund, glabrous. Sepals connate at the base, membranaceous. Dorsal sepal ovate, sharply acute, 1-nerved with very short indistinct lateral nerves near the base, about 2 mm. long and 1.2 mm. wide. Lateral sepals closely similar, slightly oblique. Petals much smaller, obovate-oval, subacute with a thickened apex, 1-nerved, about 1 mm. long. Lip slightly larger than the petals, strongly concave, subsessile, suborbicular-ovate when expanded, sharply acute, 3-nerved, lightly retuse on each side in front, about 1.2 mm. long and 1.1 mm. wide, lightly transverse-thickened near the base. Column relatively prominent, strongly clavate from a slender base, nearly as long as the petals.

This species appears to be allied to the Bolivian *Stelis cuspatha* Reichb. f., but has very different petals and lip.

Cuzco: Prov. of Quispicanchis, Hda. Itío, Marcapata, at 2000 meters altitude, in sunny rocky places, perianth pale yellowish white, January 27, 1943, *C. Vargas 3116* (Type in Herb. Ames No. 65209).

Masdevallia grandiflora *C. Schweinfurth sp. nov.*

Herba epiphytica, caespitosa, parva, cum flore comparate magno. Caules approximati, breves, vaginis duabus tubulatis nigris omnino tecti. Folium unicum, erectum, petiolatum; lamina linearis vel elliptico-linearis. Inflorescentia uniflora, quam folium conspicue brevior. Flos

nutans, membranaceus, pro planta grandis. Sepala basi in tubum campanulatum connata. Sepalum dorsale basi ovatum, longe caudatum. Sepala lateralia basi ovato- vel triangulari-lanceolata, longe caudata. Petala perparva, in circuitu oblonga, apice truncato-bilobulato, prope basim cum dente conspicuo. Labellum simplex, oblanceolato-oblongum, apice late obtusum, basi cordatum. Columna petala aequans, leviter arcuata, apice alata.

Plant epiphytic, caespitose, small, but with relatively large flowers, up to 10 cm. tall. Roots fibrous, numerous, glabrous. Stems approximate, short, sometimes with a decumbent base, about 1.8 cm. or less long, entirely or mostly concealed by two tubular sheaths which are blackish and imbricating. Leaf solitary, erect, petioled, about 6.9 cm. or less long; lamina linear or elliptic-linear, subacute with a minutely tridenticulate apex, very gradually narrowed below, coriaceous, with the mid-nerve prominent beneath, about 5.5 cm. long, up to 5.5 mm. wide; petiole slender, sulcate, blackish. Inflorescences solitary, 1-flowered, distinctly shorter than the leaf; peduncle filiform and blackish below, slightly dilated and green above, up to 5 cm. long, suberect; pedicellate ovary blackish and arcuate-recurved above, distinctly surpassing the tubular floral bract. Flower nodding, white, large for the plant but small for the genus. Sepals membranaceous, connate below into a campanulate tube which is 5–6.5 mm. long. Dorsal sepal (free part) consisting of a short rather broad basal portion and a long tail or cauda, about 3.5 cm. or less long; basal portion concave, ovate, 3-nerved, about 3 mm. long; tail filiform, relatively elongate. Lateral sepals similar to the dorsal sepal, about 3.75 cm. long with a short basal portion and an elongate tail; basal portion ovate- or triangular-lanceolate, long-acuminate, about 8.9 mm. long, slightly oblique, 3-nerved, gradually passing into the tail. Petals very small,

obliquely oblong in outline, about 3.5 mm. long, obliquely bilobulate at the abruptly truncate apex; lower portion (about one third) unguiculate-narrowed; upper portion oblong-subquadrate with a short decurved tooth (having an intramarginal keel) at the base on the anterior margin. Lip simple, oblong to oblanceolate-oblong, broadly obtuse at the apex, cordate at the base, somewhat thickened above, 3-nerved with the mid-nerve cla-

vate at the tip, about 3.8 mm. long in greatest length and 1.4 mm. wide above the middle; disc with a pair of indistinct keels through the anterior half. Column about as long as the petals, lightly arcuate, terminating in a denticulate wing.

This species seems to be nearly allied to the Ecuadorian *Masdevallia filamentosa* Kränzl., but has shorter leaves, shorter sepaline tails and dissimilar larger petals.

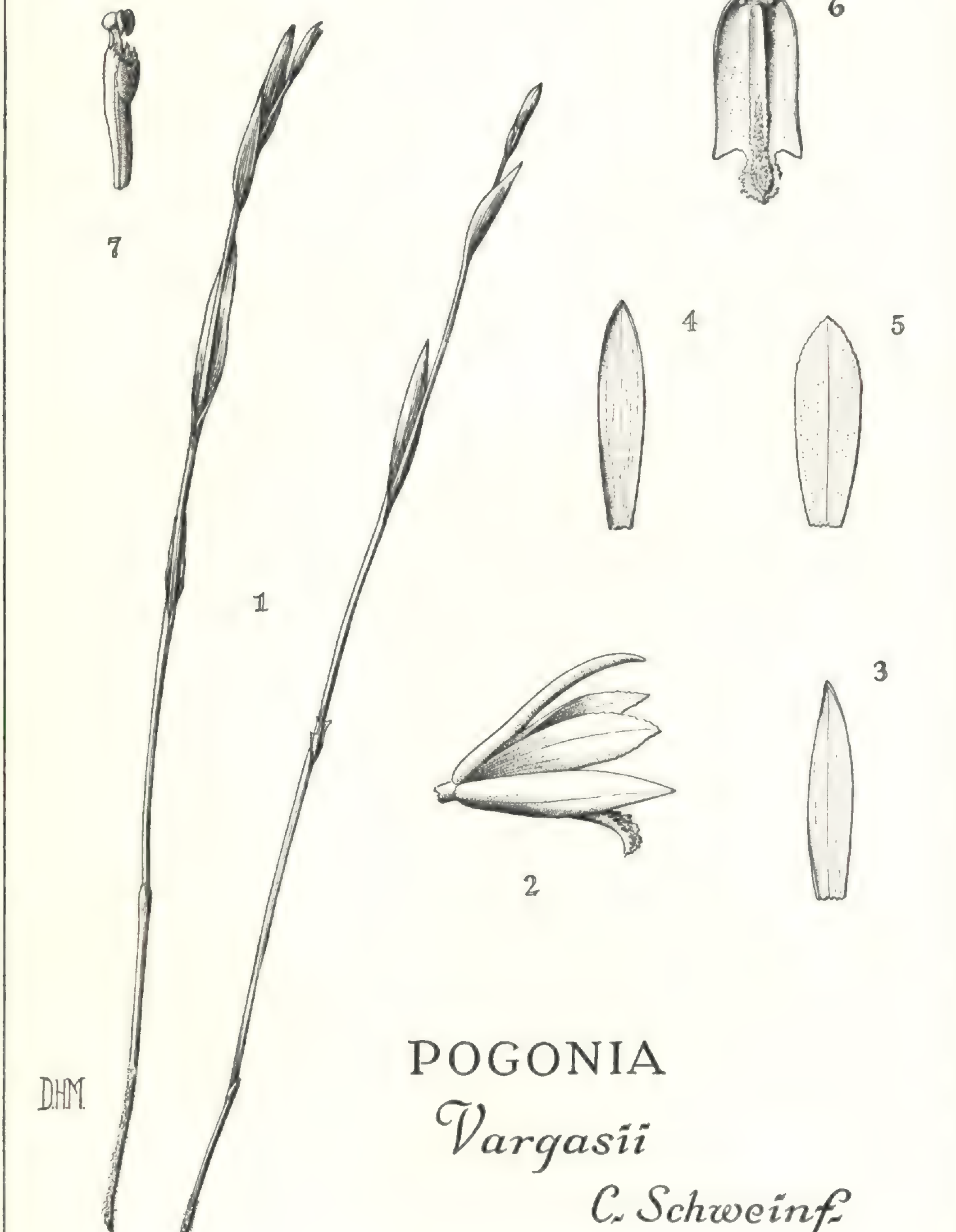
Cuzco: Prov. of Paucartambo, San Pedro to Santa Isabel, at 1350 meters altitude, on old tree trunk, December 5, 1947, *C. Vargas 006778* (Type in Herb. Ames No.64894).

EXPLANATION OF THE ILLUSTRATION

Plate I. Pogonia Vargasii *C. Schweinfurth*. 1, plants, one fourth natural size. 2, flower from side, natural position, three fourths natural size. 3, lateral sepal, three fourths natural size. 4, dorsal sepal, three fourths natural size. 5, petal, three fourths natural size. 6, lip, expanded, three fourths natural size. 7, column with anther, three quarters view, natural size.

Drawn by Dorothy H. Marsh

PLATE I



POGONIA
Vargasii

C. Schweinf.

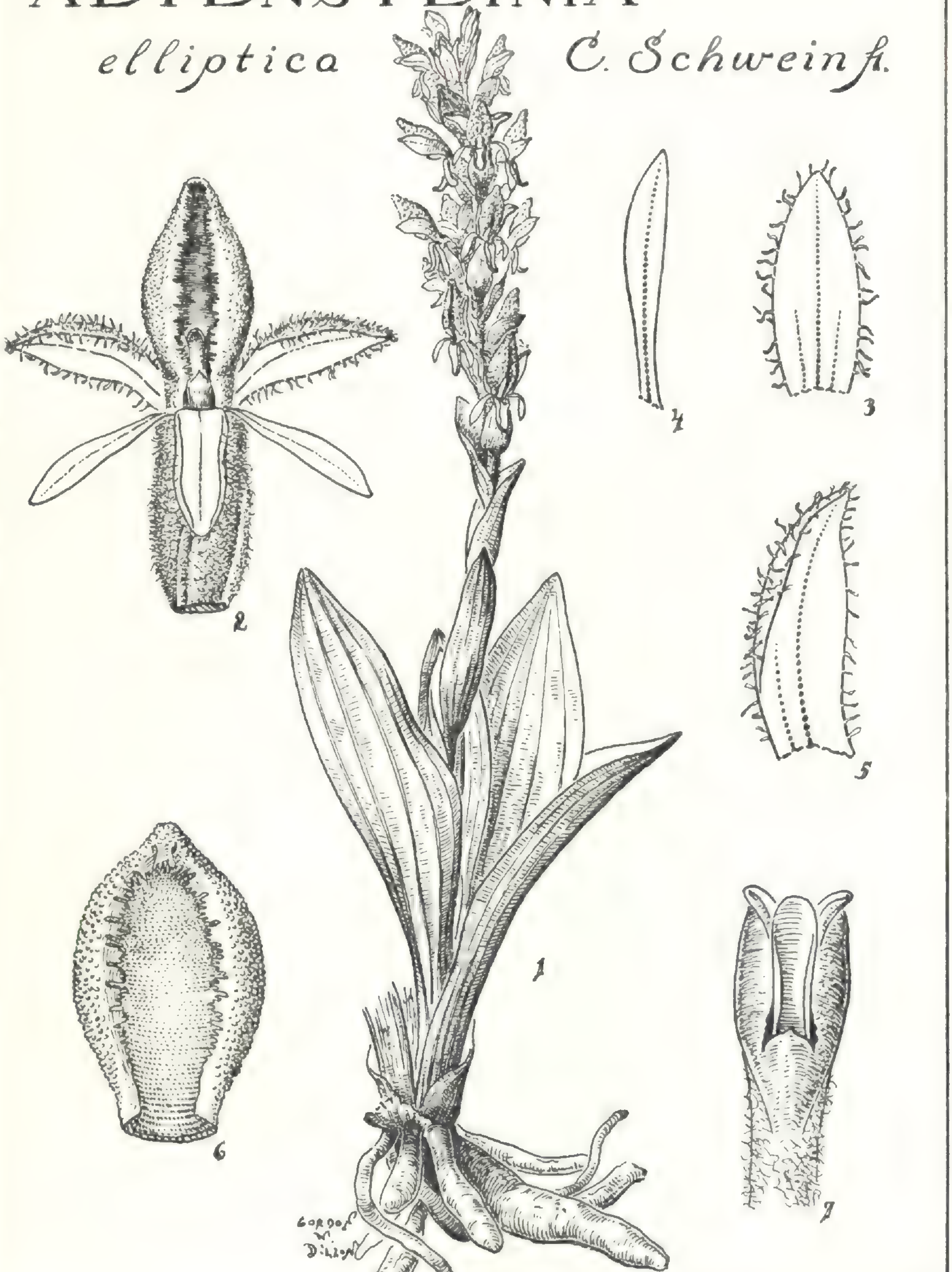
EXPLANATION OF THE ILLUSTRATION

PLATE II. ALTENSTEINIA ELLIPTICA *C. Schweinfurth.* 1, plant, four fifths natural size. 2, flower, three times natural size. 3, dorsal sepal, four times natural size. 4, petal, four times natural size. 5, lateral sepal, four times natural size. 6, lip, partially expanded, four times natural size. 7, column and summit of ovary, eight times natural size.

Drawn by GORDON W. DILLON

ALTENSTEINIA

elliptica *C. Schweinf.*



EXPLANATION OF THE ILLUSTRATION

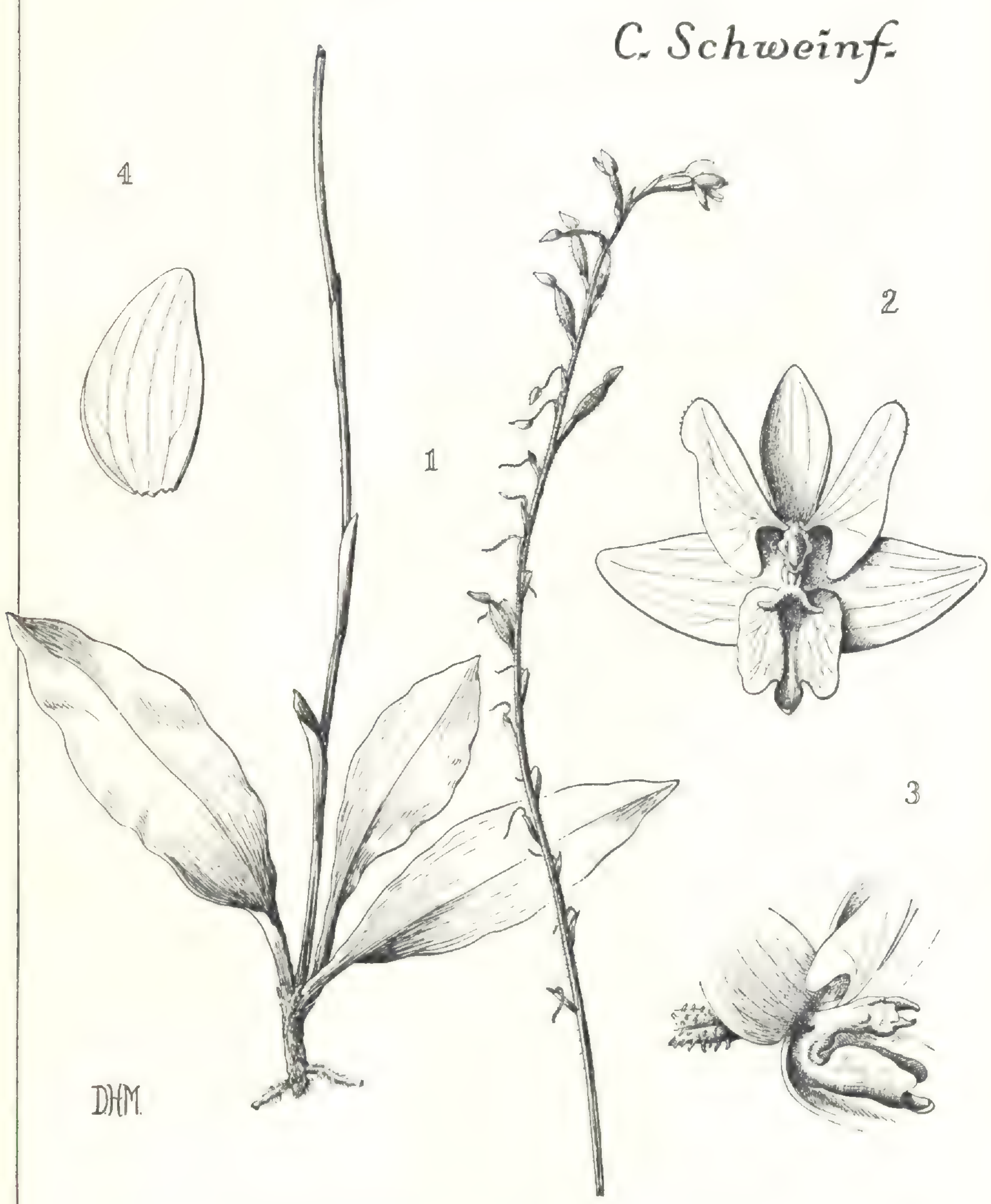
PLATE III. PONTHIEVA BICORNUTA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, expanded, three times natural size. 3, column and lip from side, natural position, three times natural size. 4, lateral sepal, three and one half times natural size.

Drawn by DOROTHY H. MARSH

PONTHIEVA

bicornuta

C. Schweinf.

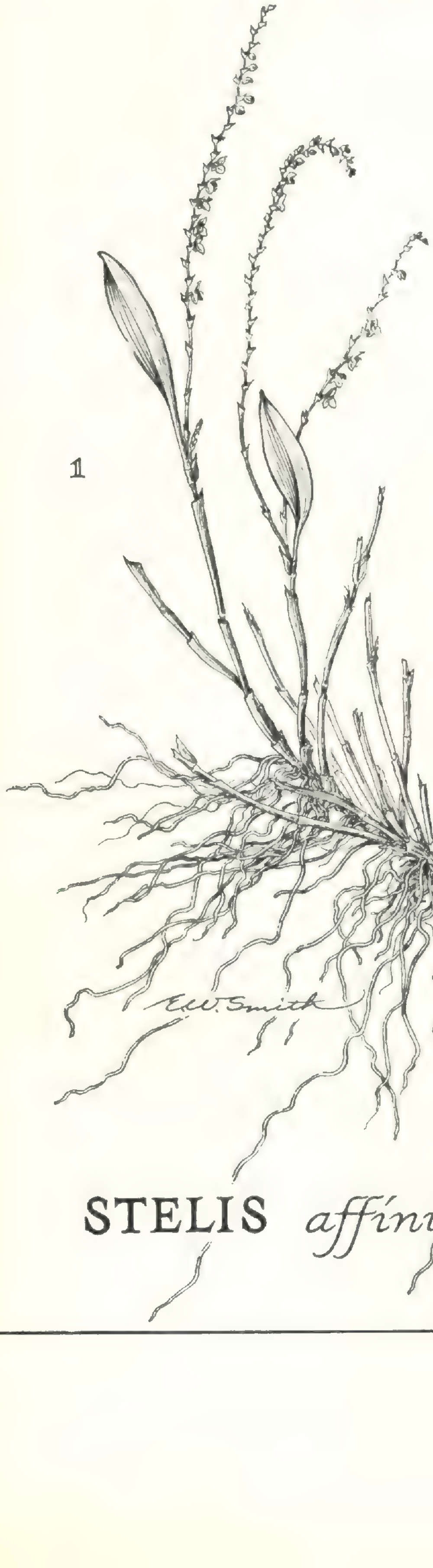


EXPLANATION OF THE ILLUSTRATION

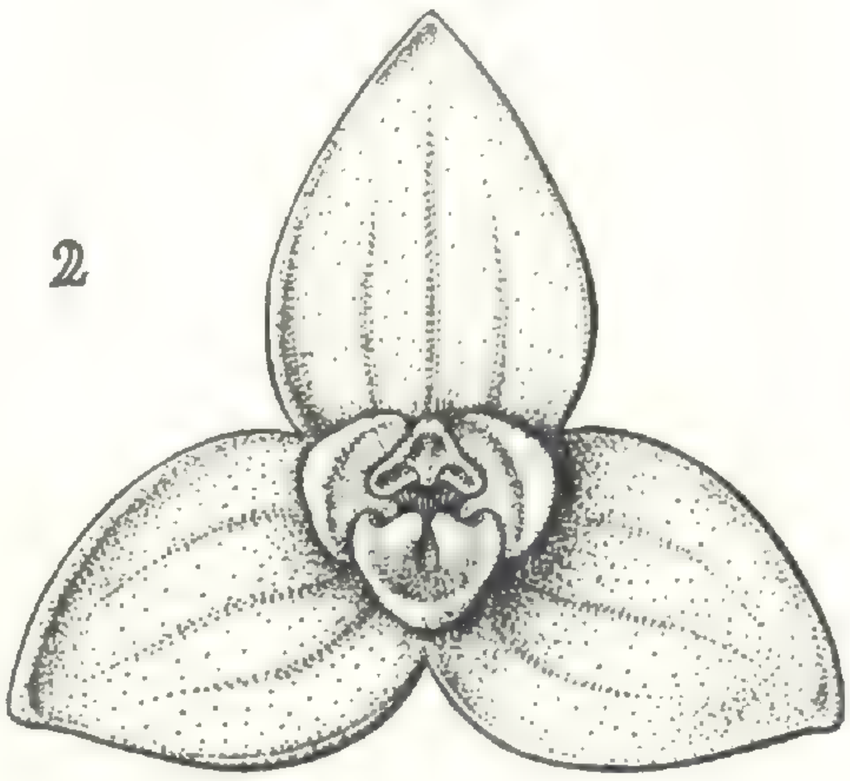
PLATE IV. STELIS AFFINIS *C. Schweinfurth*. 1, plant, two thirds natural size. 2, flower from front, ten times natural size. 3, petal, twenty times natural size. 4, lip from side, twenty times natural size. 5, lip from front, twenty times natural size.

Drawn by ELMER W. SMITH

Plate IV



1



2

3

4

5

STELIS *affinis* *C. Schweinf.*

EXPLANATION OF THE ILLUSTRATION

PLATE V. STELIS ASCENSOR *C. Schweinfurth*. 1, plant, two thirds natural size. 2, flower from side, natural position, about four times natural size. 3, flower, expanded, from front, eight times natural size. 4, petal, twenty times natural size. 5, lip from front, twenty times natural size. 6, lip from side, twenty times natural size.

Drawn by ELMER W. SMITH

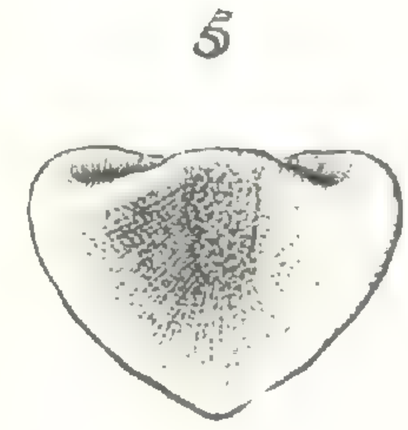
STELIS ascensor C. Schweinf.

1

2

3

4



5

6

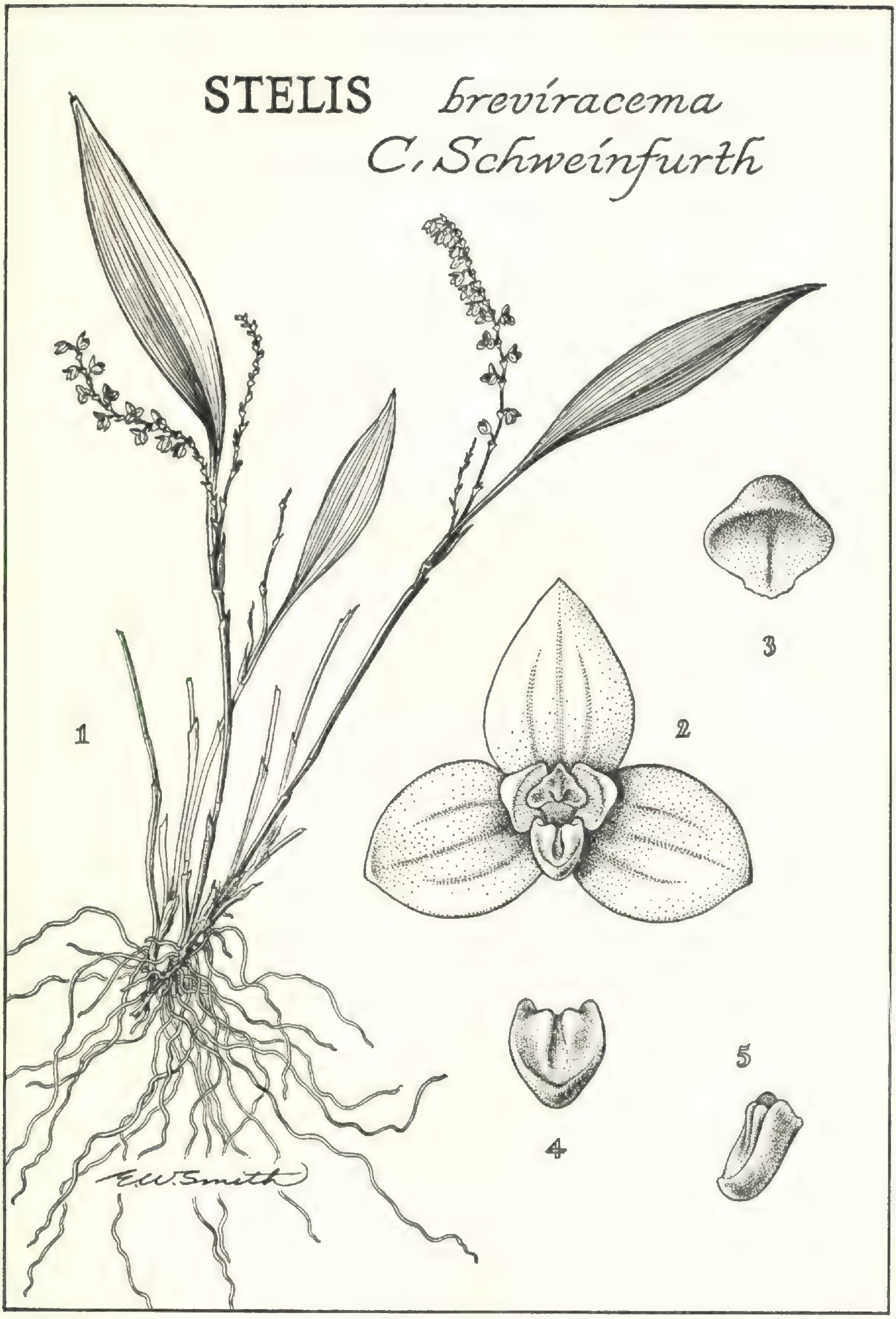
E. W. Smith

EXPLANATION OF THE ILLUSTRATION

PLATE VI. STELIS BREVIRACEMA *C. Schweinfurth*. 1, plant, two thirds natural size. 2, flower from front, ten times natural size. 3, petal, sixteen times natural size. 4, lip from front, sixteen times natural size. 5, lip from side, sixteen times natural size.

Drawn by ELMER W. SMITH

PLATE VI



EXPLANATION OF THE ILLUSTRATION

PLATE VII. STELIS CURVICARINA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, three quarters view, eight times natural size. 3, petal, twenty times natural size. 4, lip from front, thirty times natural size. 5, lip from side, thirty times natural size.

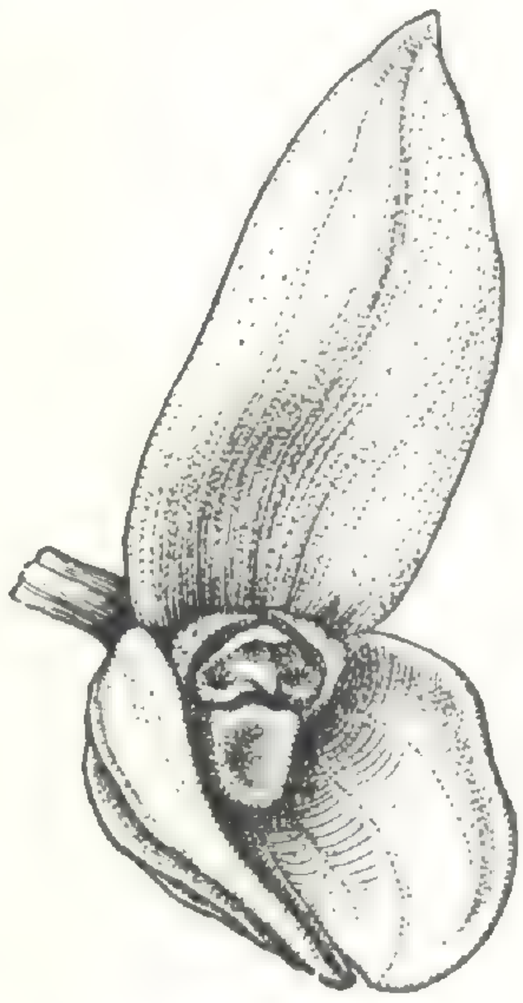
Drawn by ELMER W. SMITH

STELIS

curvícarína

C. Schweinf.

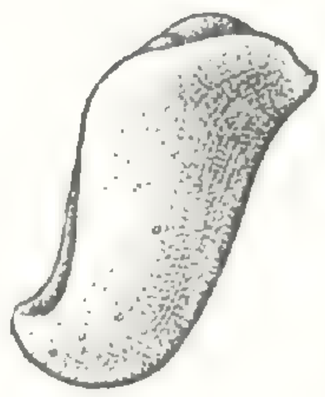
3



2

1

4



5

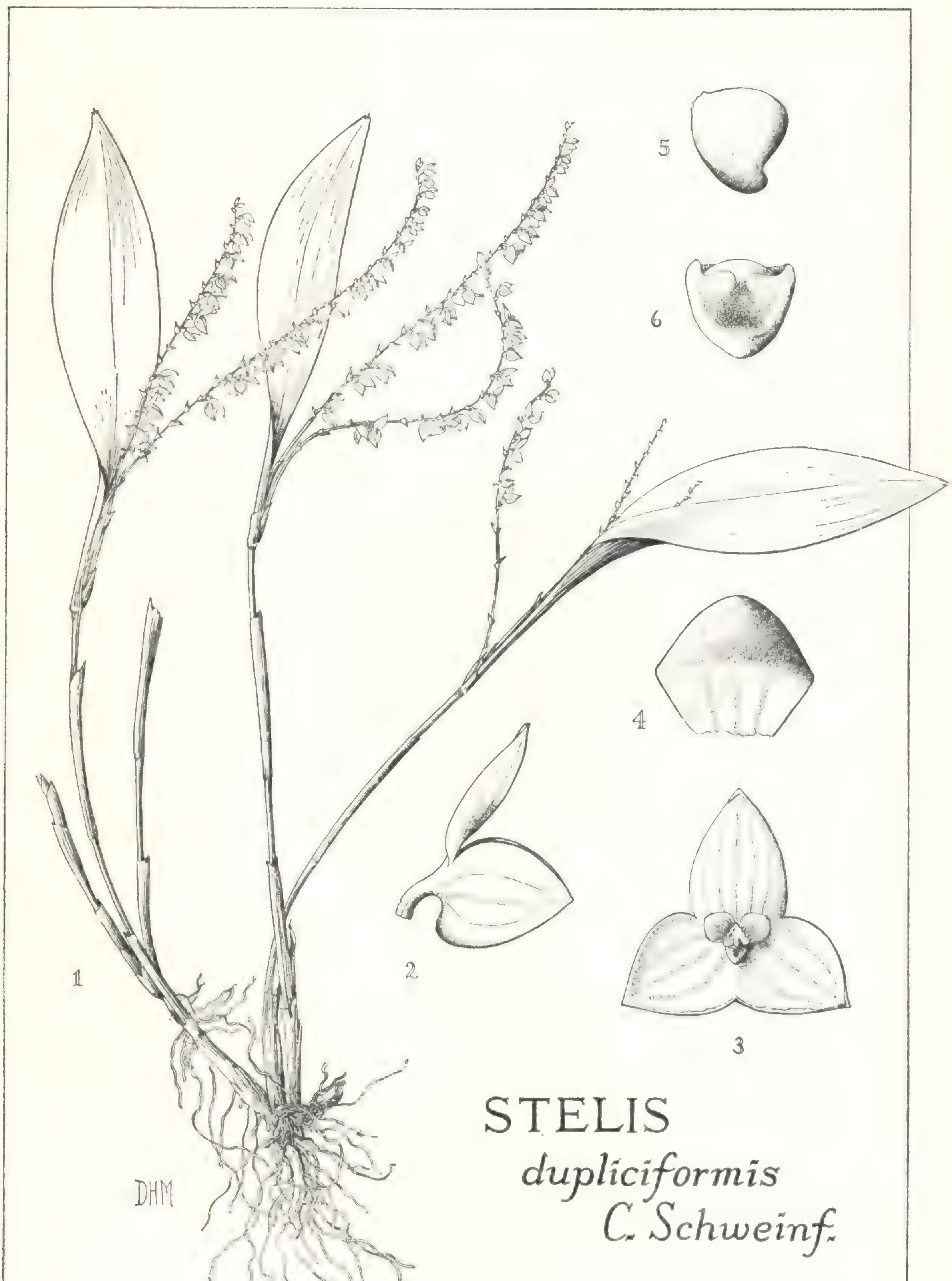
E.W. Smith

EXPLANATION OF THE ILLUSTRATION

PLATE VIII. STELIS DUPLICIFORMIS *C. Schweinfurth.* 1, plant, one half natural size. 2, flower from side, three times natural size. 3, flower from front, expanded, three times natural size. 4, petal, ten times natural size. 5, lip from side, ten times natural size. 6, lip from front, ten times natural size.

Drawn by DOROTHY H. MARSH

Plate VIII



STELIS

duplicíformis

C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

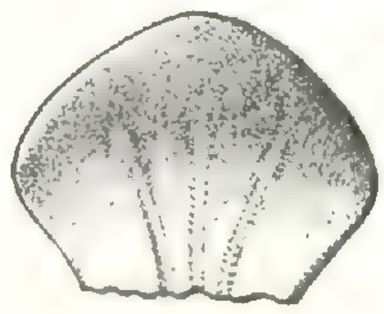
PLATE IX. STELIS GRACILISPICA *C. Schweinfurth.* 1, plant, one half natural size. 2, lip from above, twenty-five times natural size. 3, flower from front, expanded, seven times natural size. 4, flower from side, natural position, seven times natural size. 5, petal, twenty times natural size.

Drawn by DOROTHY H. MARSH

STELIS *gracilispica* *C. Schweinf.*

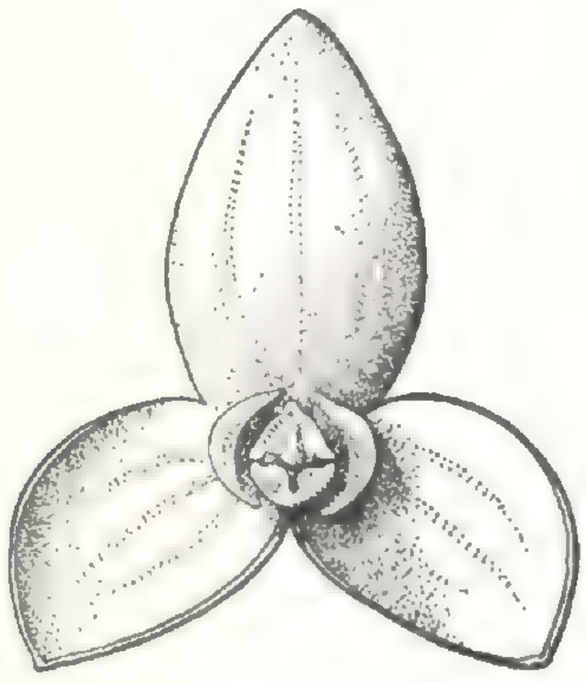
1

2



5

4



3

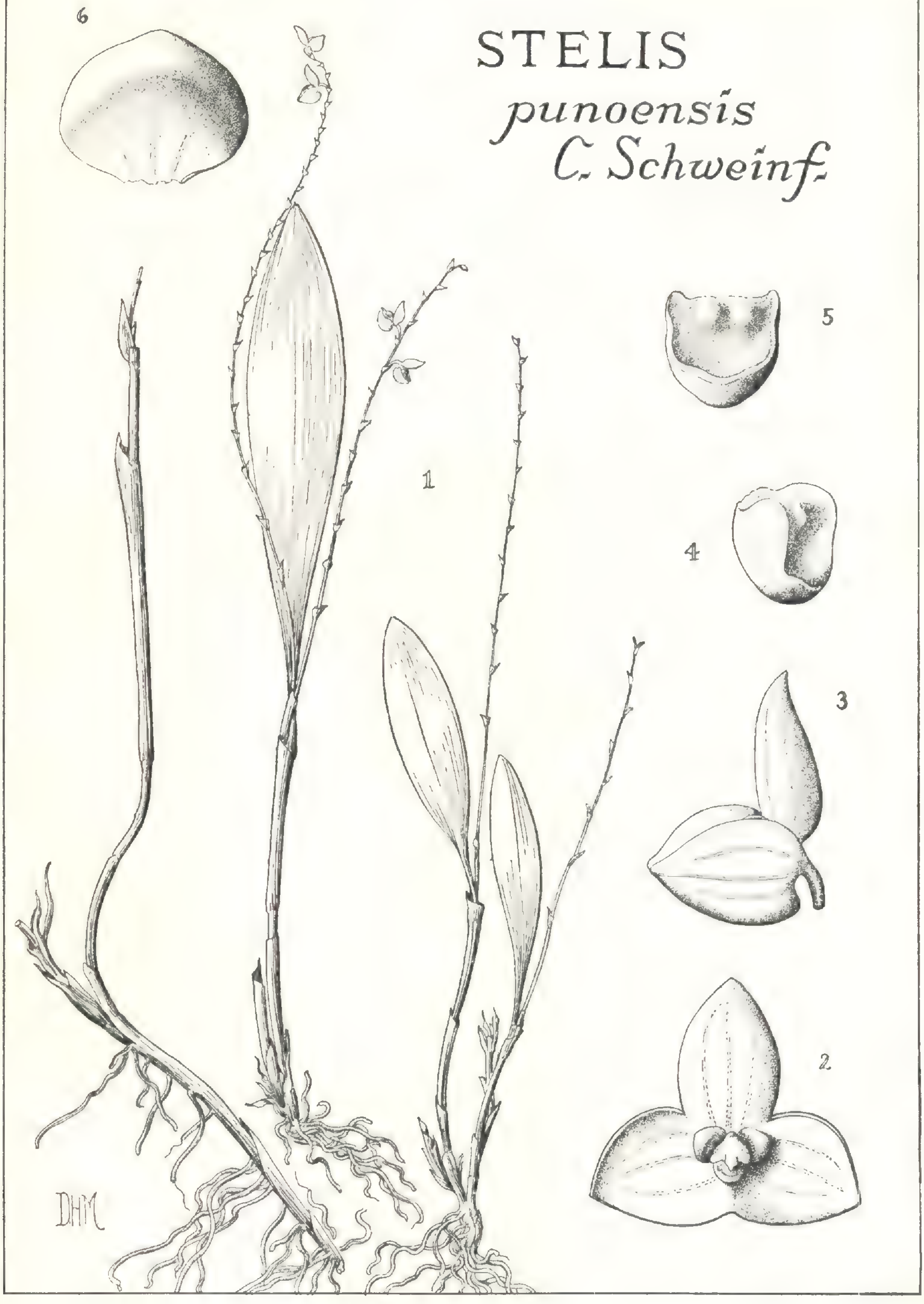
D.H.M.

EXPLANATION OF THE ILLUSTRATION

PLATE X. STELIS PUNOENSIS *C. Schweinfurth.* 1, plants, three fourths natural size. 2, flower from front, three times natural size. 3, flower from side, three times natural size. 4, lip, three quarters view, fifteen times natural size. 5, lip from front, fifteen times natural size. 6, petal, fifteen times natural size.

Drawn by DOROTHY H. MARSH

PLATE X



EXPLANATION OF THE ILLUSTRATION

PLATE XI. STELIS RHOMBILABIA *C. Schweinfurth.* 1, plant, three eighths natural size. 2, flower from front, expanded, six times natural size. 3, flower, three quarters view, six times natural size. 4, lip from front, twenty-five times natural size. 5, lip from above, fifteen times natural size. 6, petal, twenty-five times natural size.

Drawn by DOROTHY H. MARSH

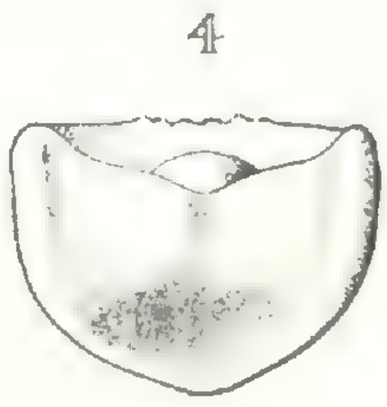
Plate XI

EXPLANATION OF THE ILLUSTRATION

PLATE XII. STELIS TRIANGULISEPALA *C. Schweinfurth.* 1, plant, one and one eighth times natural size. 2, flower, five times natural size. 3, lip from side, twenty times natural size. 4, lip from front, twenty times natural size.

Drawn by DOROTHY H. MARSH

STELIS
triangulisepala
C. Schweinf.



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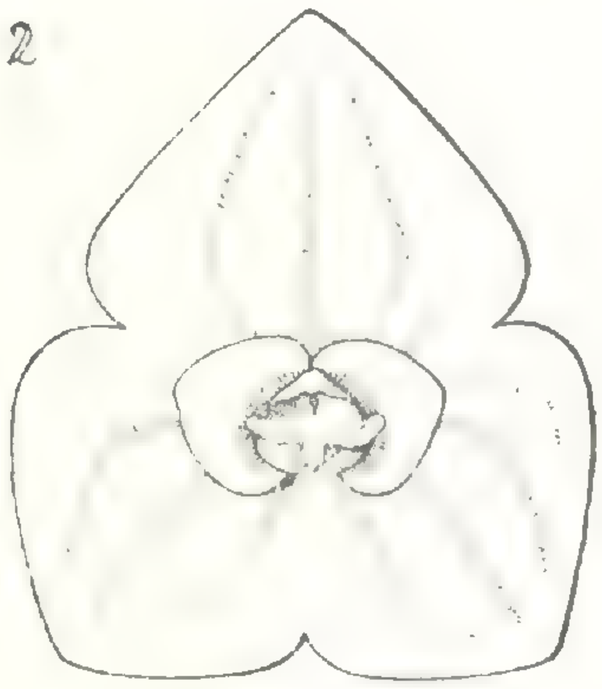
3



2

1

DHM.

EXPLANATION OF THE ILLUSTRATION

PLATE XIII. STELIS UNINERVIA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, twelve times natural size. 3, petal, twenty times natural size. 4, lip from the front and the side, twenty times natural size.

Drawn by ELMER W. SMITH

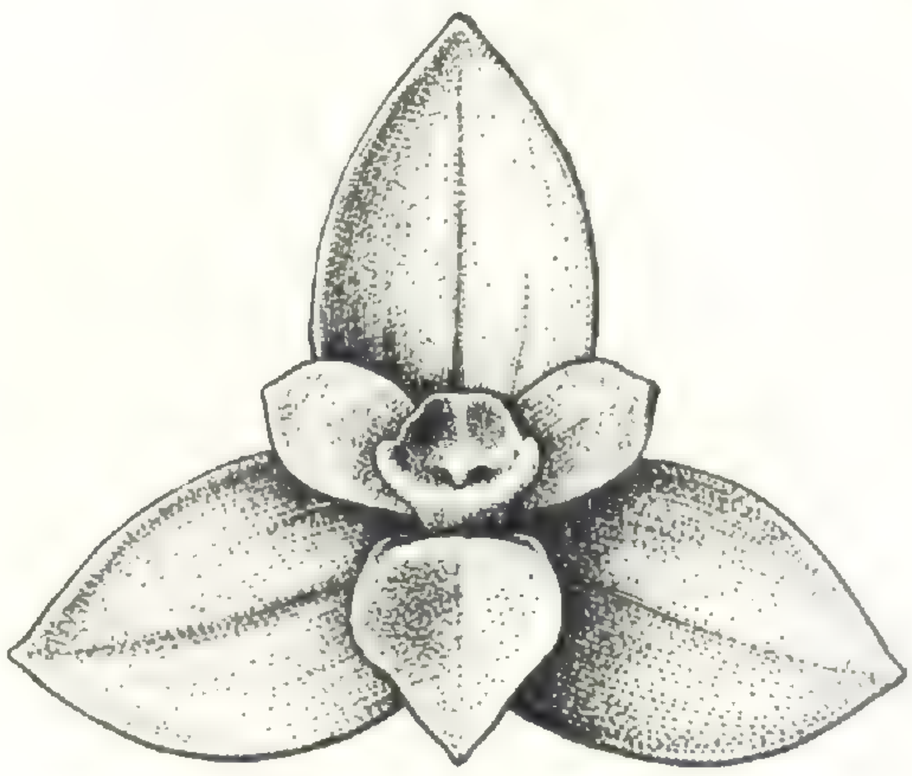
PLATE XIII

STELIS

unínervía

C. Schweínf.

1



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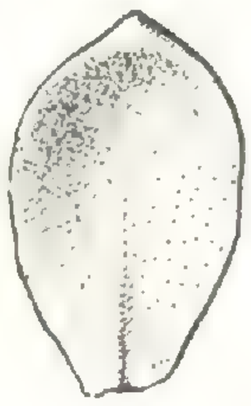

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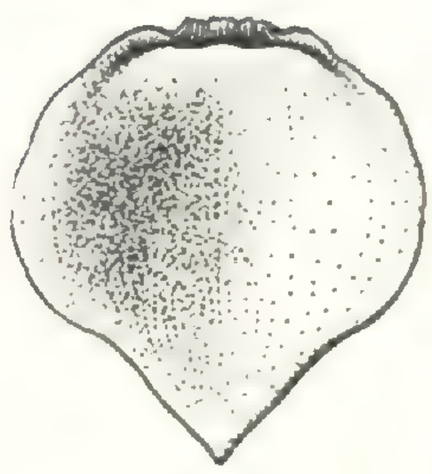


4

E. W. Smith

EXPLANATION OF THE ILLUSTRATION

PLATE XIV. MASDEVALLIA GRANDIFLORA *C. Schweinfurth*. 1, plant, one and one half times natural size. 2, flower, partially expanded, one and one half times natural size. 3, petal, six times natural size. 4, lip, six times natural size.

Drawn by DOROTHY H. MARSH

Plate XIV

MASDEVALLIA
grandiflora
C. Schweinf.

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JUNE 29, 1951 VOL. 15, NO. 2

PLANTAE AUSTRO-AMERICANAE VII

DE FESTO SECULARI RICARDI SPRUCEI AMERICA AUSTRALI ADVENTU COMMEMORATIO ATQUE DE PLANTIS PRINCIPALITER VALLIS AMAZONICIS DIVERSAE OBSERVATIONES

BY

RICHARD EVANS SCHULTES[1]

ONE HUNDRED years ago, on July 12, 1849, Richard Spruce arrived in the Amazon Valley to begin his epochal botanical explorations in South America. After the passage of a century, Spruce's work remains the most complete phytogeographic labor ever carried out in the Amazonia. His collections from the Rio Negro basin, where, fighting overwhelming odds of sickness, hunger, weariness and loneliness, he explored continuously from 1851 to 1855, have been exceedingly rich in novelties and are still yielding new species and varieties to monographers.

Spruce had an uncanny ability at searching out the extraordinarily rare endemics which characterize the isolated caatingas of the Rio Negro. Many have never been collected since Spruce's day, whereas others have been appearing sporadically in recent collections from that apparently most inexhaustible of areas.

From September 1947 through July 1948, I explored

[1]Botanist, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture; Research Fellow, Botanical Museum, Harvard University.

the upper Rio Negro valley in Colombia and Brazil, carrying out investigations of *Hevea* rubber and allied plants for the Bureau of Plant Industry of the United States Department of Agriculture in collaboration with the Instituto Agronômico do Norte. In large measure, I followed the trail of Richard Spruce in search of rare species of *Hevea;* it was possible also to make a small general collection, especially from the caatingas. It is amazing to learn how many of the collections represent plants which seem not to have been collected since Spruce's time. The same is true of the collections of other naturalists (Ducke, Fróes, Baldwin, Murça Pires and Black) who have recently penetrated the Rio Negro.

With deep respect and in a spirit of humbleness, I dedicate this paper to Richard Spruce on the occasion of the Centennial of his arrival on the continent of South America for his self-sacrificing exploration which, without respite, he carried out from 1849 to 1864 in Brazil, Colombia, Ecuador, Peru and Venezuela. A pioneer phytogeographer, he was animated by a deep love of all nature and an insatiable thirst for knowledge in pure science. In dedicating this paper, I cannot refrain from using two touching passages from Spruce's writings which reveal the inner soul of the man. In a letter written at São Gabriel on the Rio Negro on February 17, 1851 to Mr. Baines and preserved in the Yorkshire Philosophical Society (Report 1907 Yorksh. Philos. Soc. (1907) 18), we read what has appealed to me as the simplest and most honest presentation of the underlying motives of phytogeographical endeavors.

"Then there is the greatest of all pleasures to the naturalist, however some utilitarians may affect to undervaluate it, that of discovering new species, of dotting in (as it were) new islands on the map of nature, and, in some cases, of even peopling continents that appear to be deserts."

And, in another letter, directed to Mr. George Ben-

tham, and published in his "Notes of a Botanist on the Amazon and the Andes" 2 (1908) 20, Spruce reveals how, in spite of oppressive sickness and weariness, his dynamic love of knowledge for the sake of knowledge encouraged and spurred him on to incredible feats.

"I have lately been calculating the number of species that yet remain to be discovered in the great Amazonian forest, from the cataracts of the Orinoco to the mountains of Matto Grosso; taking the fact that by moving away a degree of latitude or longitude I found about half the plants different as a basis, and considering what very narrow strips have, up to this day, been actually explored, and *that* often very inadequately, by Humboldt, Martius and myself, and others, there should still remain some 50,000 or even 80,000 species undiscovered. To anyone but me and yourself this estimation will appear most extravagant, for even Martius (if I recollect rightly) emits an opinion that the forests of the Amazon contain but few specimens. . .

"At the highest point I reached on the Uaupés, the Jaguaraté Caxoeira [now the boundary line between Brazil and Colombia], I spent about a fortnight, in the midst of heavy rains, when (according to my constant experience) very few forest trees open their flowers. But when the time came for my return to Panuré . . . . the weather cleared up, and as we shot down among the rocks which there obstruct the course of the river, on a sunny morning, I well recollect how the banks of the river had become clad with flowers, as it were by some sudden magic, and how I said to myself, as I scanned the lofty trees with wistful and disappointed eyes, 'there goes a new *Dipteryx* — there goes a new *Qualea* — there goes a new *the Lord knows what!*' until I could no longer bear the sight, and covering up my face with my hands, I resigned myself to the sorrowful reflection that I must leave all these fine things 'to waste their sweetness on the desert air.' From that point upwards, one may safely assume that nearly everything was new, and I have no doubt that the tract of country lying eastward from Pasto and Popayán where are the head-waters of the Japuré, Uaupés, and Guaviare — . . . . offer as rich a field for a botanist as any in South America. But I have made enquiries as to the possibility of reaching it, and I find that it will be necessary to cross páramos of the most rugged and inhospitable character, and afterwards risk oneself among wild and fierce Indians, so that I fear its exploration must be left to some one younger and more vigorous than myself."

Study of plant collections made during the past ten years, chiefly in the Amazon Valley of Brazil and Co-

EXPLANATION OF THE ILLUSTRATION

PLATE XV. RICHARD SPRUCE. From a photograph in the Gray Herbarium.

Drawn by ELMER W. SMITH

Plate XV

lombia—in Spruce's territory,—has resulted in a number of interesting additions to our knowledge of the South American flora. In the following pages, I have presented a miscellany of notes of an ethnobotanical, phytogeographical, ecological or historical nature, together with the description of a number of new species.

I acknowledge gratefully the valuable collaboration of a number of my colleagues who have determined special groups of plants for me: Mr. A. H. G. Alston (*Selaginella*); Dr. L. H. Bailey and Dr. H. Emery Moore (*Palmae*); Mr. J. A. Steyermark (*Senefelderopsis*); Dr. José Cuatrecasas (*Tiliaceae* and *Quararibea*); Dr. Bassett Maguire (*Guttiferae*); Mr. Joseph Monachino (*Pouteria*); Dr. Lyman B. Smith (*Bromeliaceae*); and Dr. Robert Woodson (*Apocynaceae*). It is a pleasure to express my thanks to the authorities of the Jardín Botanico in Madrid for their kind permission for me to publish notes on several of the Mutis water-colors of Colombian plants which I had the great good fortune to examine in some detail in June 1950. I have also to thank Mr. Elmer W. Smith and Mrs. Dorothy H. Marsh whose appreciated artistry has enlivened and enhanced certain of the material herein presented.

Selaginellaceae

Selaginella amazonica *Spring* in Martius Fl. Bras. 1, pt. 2 (1840) 124.

Alston (in Fedde Repert. 40 (1936) 308) cites six collections of *Selaginella amazonica*, all from the Río Negro or its uppermost affluents. Two of the collections cited below establish the presence of this species in Colombian territory. It is usually a caatinga plant, but can grow in dense carpets on rocky and exposed mountain tops, as evidenced by *Schultes & López 10104*.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Uaupés, at base of Serra Tukano. November 7, 1947, *Richard Evans Schultes & João Murça Pires 9005.*

Colombia: Comisaría del Vaupés, Río Negro, opposite Piedra del Cocuy. December 26, 1947, *Richard Evans Schultes & Francisco López 9523.*—Comisaría del Vaupés, Río Guainía basin, Río Naquieni, Cerro Monachí. "On top of mountain." June, 1948, *Richard Evans Schultes & Francisco López 10104.*

Selaginella asperula *Spring* in Martius Fl. Bras. 1, pt. 2 (1840) 127.

Ranging from Venezuela to Peru and Bolivia, this species is especially concentrated in the Rio Negro Valley from which area Alston (l.c. 309) cites seven collections. *Schultes & López 9522* is the first collection from Colombian territory. This species is native to xerophytic caatingas and grows on white sand.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Uaupés, at base of Serra Tukano. "On white sand in caatinga." November 7, 1947, *Richard Evans Schultes & João Murça Pires 9031.*—Estado do Amazonas, Rio Negro basin, Rio Uaupés, Ipanoré. "On sandy caatinga." November 14–15, 1947, *Richard Evans Schultes & João Murça Pires 9085.*—Same locality and date, *Schultes & Pires 9086.*—Estado do Amazonas, Rio Negro basin, Rio Xié near mouth. December 2, 1947, *Richard Evans Schultes & Francisco López 9202.*—Estado do Amazonas, Rio Negro basin, Rio Xié, Cachoeira Cumatí. December 3, 1947, *Richard Evans Schultes & Francisco López 9218.*

Colombia: Comisaría del Vaupés, Río Negro, opposite Piedra del Cocuy. December 26, 1947, *Richard Evans Schultes & Francisco López 9522.*

Selaginella cordifolia (*Desv. ex Poir.*) *Spring* in Bull. Acad. Brux. 10 (1843) 228.

Selaginella cordifolia, known from Puerto Rico, Cuba, Hispaniola and tropical Brazil, is one of the commonest species in sandy areas of the upper Rio Negro basin. It is herewith registered for the flora of Venezuela for the first time.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Uaupés, Serra Wabeesee, on left bank below Bela Vista. "On forest floor." Novem-

ber 17, 1947, *Richard Evans Schultes & João Murça Pires 9147*.—Estado do Amazonas, Rio Negro, São Gabriel (Uaupés), on Serra São Gabriel. "Very small, grows pendant on mossy rocks. Apparently never larger." November 20–25, 1947, *Richard Evans Schultes & Francisco López 9171*.

VENEZUELA: Territorio del Amazonas, Río Negro, Cerro Cocuy. "On wet rocks." December 22–23, 1947, *Richard Evans Schultes & Francisco López 9428*.

Selaginella fragilis *A. Braun* in Ann. Sci. Nat. sér. 5, 3 (1865) 305.

This species of *Selaginella* appears to be endemic to the uppermost Rio Negro. It is known only through two previous collections (Alston l.c. 310).

BRAZIL: Estado do Amazonas, Rio Negro, São Gabriel, Serra de São Gabriel. September 15, 1947, *Richard Evans Schultes & Francisco López 8760*.—Estado do Amazonas, Rio Negro, Jucabí at mouth of Rio Curicuriarí. April 23, 1948, *Richard Evans Schultes & Francisco López 9838*.

Selaginella Kochii *Hieronymus ex Koch-Grünberg* Zwei Jahre unter den Indianern 2 (1910) 361; Fedde Repert 8 (1910) 151.

This species, collected by the famous anthropologist-explorer of the Rio Negro area, Dr. Koch-Grünberg, has previously been known from the type alone. The type was collected in the Colombian part of the Río Negro Valley. It is a species of shaded forest floors. It is herewith recorded for the flora of Venezuela.

BRAZIL: Estado do Amazonas, Rio Negro basin, Rio Uaupés, Serra Wabeesee on left bank below Bela Vista. November 17, 1947, *Richard Evans Schultes & João Murça Pires 9134*.—Estado do Amazonas, Rio Negro, São Gabriel. "On forest floor." November 20–25, 1947, *Richard Evans Schultes & Francisco López 9176*.—Estado do Amazonas, Rio Negro basin, Rio Curicuriarí, Serra Curicuriarí. "On summit of mountain in forests." April 26, 1948, *Richard Evans Schultes & Francisco López 9827*.

VENEZUELA: Territorio del Amazonas, Cerro Cocuy. "Carpeting humus and rock slopes." December 22–23, 1947, *Richard Evans Schultes & Francisco López 9428*.

Selaginella producta *Baker* in Journ. Bot. 21 (1883) 243.

Selaginella producta was collected several times by Spruce along the entire Rio Negro. *Schultes & López 9219* is the sixth collection of this curious caatinga species.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Xié, Cachoeira Cumatí. December 3, 1947, *Richard Evans Schultes & Francisco López 9219.*

Selaginella revoluta *Baker* in Journ. Bot. 21 (1883) 14.

Selaginella revoluta has been known from the uppermost parts of the Rio Negro Valley in Brazil and from the distant Río Ucayali in Peru (Alston l.c. 315).

Brazil: Estado do Amazonas, Rio Negro, Jucabí near mouth of Rio Curicuriarí. April 23, 1948, *Richard Evans Schultes & Francisco López 9839.*

Selaginella stellata *Spring* in Martius Fl. Bras. 1, pt. 2 (1840) 129.

Selaginella stellata was described from material from the lower course of the Amazon. These recent collections extend our knowledge of the distribution of this species.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Xié, near mouth. December 2, 1947, *Richard Evans Schultes & Francisco López 9202.*—Estado do Amazonas, Rio Negro basin, Rio Dimití. "On mountain side." May 12–19, 1948, *Richard Evans Schultes & Francisco López 9950.*

Selaginella subarborescens *Hooker* in Sec. Cent. Ferns (1861) t. 84.

This large species of *Selaginella* has been known only from the type collection which was made by Spruce on the Rio Uaupés in Brazil. *Schultes & Pires 9056* is the second collection and is from the type region. Since the type was collected on the Colombian-Brazilian boundary,

Selaginella subarborescens should also be included in an enumeration of Colombian species.

Brazil: Estado do Amazonas, Rio Negro basin, Rio Uaupés, mountain near Taracuá, at mouth of Rio Tikié. November 9, 1947, *Richard Evans Schultes & João Murça Pires 9056*.

Alismaceae

Sagittaria Sprucei *Micheli* in de Candolle Monogr. Phan. 3 (1881) 80.

Spruce collected the type of this aquatic plant near Manáos in 1855. It has been collected also from Belém do Pará at the mouth of the Amazon. *Black & Schultes 46–249* represents, apparently, the first collection from Colombia. It is a widespread element along the Amazon River.

Colombia: Comisaría del Amazonas, Río Loretoyacu, October 30, 1946, *G. A. Black & R. E. Schultes 46-249*.

Palmae

Ammandra decasperma *Cook* in Journ. Wash. Acad. Sci. 17 (1927) 218, 220.

The type and apparently only other reported collection of this palm was from Buenaventura. *Schultes 7353* is from a locality rather near Buenaventura.

Colombia: Departamento de El Valle, Río Calima, Quebrada La Brea, 30–40 m. above sea-level. "In clumps. Leaves 3 m. long. Whole plant 4 m. tall. Flowers white." May 19, 1946, *Richard Evans Schultes 7353*.

Astrocaryum Munbaca *Martius* Hist. Nat. Palm. 2 (1824) 74.

Astrocaryum Munbaca, a palm of the Guianas and Brazil, has apparently not hitherto been reported from Colombia.

Colombia: Comisaría del Amazonas, path from El Encanto (Río Caraparaná) to La Chorrera (Río Igaraparaná). "20 feet tall. Fruit

orange, edible. Very sharp spines on stem. Witoto name: *rui-rĕ̆-gö.*'' May 31–June 2, 1942, *Richard Evans Schultes 3885.*

Geonoma hexasticha *Spruce* in Journ. Linn. Soc. 11 (1871) 110, 116.

Geonoma hexasticha has apparently not hitherto been recorded for the flora of Colombia. The type was collected by Spruce at São Gabriel on the Río Negro. *Schultes & López 9353* is probably the second collection of the species.

Colombia: Comisaría del Vaupés, Río Negro, Igarapé Rana (Caño Ducuruapo), at confluence of Ríos Guainía and Casiquiare. ''Low palm. Flowers purplish, fragrant.'' December 3, 1947, *Richard Evans Schultes & Francisco López 9353.*

Geonoma paniculigera *Martius* Hist. Nat. Palm. 2 (1823) 11, t. 10.

This species, according to Dugand (in Caldasia 1 (1940) 47), occurs along the Río Caquetá in eastern Colombia and in Antioquia. *Schultes 3886* is the first record from the Putumayo drainage area and the third collection from Amazonian Colombia. *Schultes 3956*, from the same region, is probably referable also to this species, but is sterile.

Colombia: Comisaría del Amazonas, path from El Encanto (Río Caraparaná) to La Chorrera (Río Igaraparaná). ''Witoto name: *go-gö-rĕ̆.*'' May 31–June 2, 1942, *Richard Evans Schultes 3886.*

Hyospathe elegans *Martius* Hist. Nat. Palm. 2 (1823) 1 (ex parte) t. 2 (excl. t. 1).

Known hitherto from British Guiana and Brazil, *Hyospathe elegans* is now recorded for the flora of Amazonian Colombia.

Colombia: Comisaría del Amazonas, path from El Encanto (Río Caraparaná) to La Chorrera (Río Igaraparaná). ''Small, 8 ft. tall. Witoto name: *yeé-rö.*'' May 31–June 2, 1942, *Richard Evans Schultes 3892.*

Jessenia polycarpa *Karsten* in Linnaea 28 (1856) 388.

Widespread in Venezuela and Colombia, *Jessenia polycarpa*—the *milpesos* of the Colombian Amazon—is one of the most conspicuous elements of the great Amazon and Orinoco forests. It supplies one of the chief, although transient, thatches of the Witoto Indians of El Encanto and La Chorrera. These Indians, who call the plant *ko-maí-hĕ*, believe that the fruits of *Jessenia polycarpa*, if eaten as a food, possess strong antitubercular properties.

COLOMBIA: Comisaría del Amazonas, Río Caraparaná, El Encanto. May 22–28, 1942, *Richard Evans Schultes 3864.*

Leopoldinia pulchra *Martius* Hist. Nat. Palm. 2 (1824) 59, t. 52–53, fig. 1–15.

According to Dugand (in Caldasia 1 (1940) 43), this beautiful palm is known in Colombia from Mitú on the Río Vaupés. Through one of its common names (*yará*), it has been reported also from the Río Puritú in the *trapecio amazónico* (Convers Pinzón in Bol. Soc. Geogr. Col. 4 (1937) 227). *Schultes & López 9346* is apparently the second Colombian collection to be reported. *Leopoldinia pulchra* seems to occur most frequently in association with the proterozoic granitic shield. Therefore, we may expect it to be found only near the Brazilian boundary in Colombia, except perhaps for several small, isolated and outlying outcrops of this formation far to the west (e.g., near Araracuara).

The Tukano Indian name of *Leopoldinia pulchra* in the upper Rio Negro basin is *wee-peé-yo-nĕ*.

COLOMBIA: Comisaría del Vaupés, Río Negro, Igarapé Rana (Caño Ducuruapo), at confluence of Ríos Guainía and Casiquiare. "Fifteen feet tall. Leaf one meter long. Along flood-bank." December 13, 1947, *Richard Evans Schultes & Francisco López 9346.*

Mauritia minor *Burret* in Notizbl. 11 (1930) 1.

Mauritia minor, described from material from the upper Caquetá of Colombia, forms dense stands in the nearly permanent bogs of the forest in the Comisarías del Caquetá, del Putumayo and del Amazonas (Dugand l.c. 32). In Witoto, the fruit of the *canangucho* or *Mauritia minor*, is called *gui-nĕ-na-kö-nĕ-kö*. It is gathered in quantity for the preparation of an alcoholic beverage known locally as *chicha de canangucho*.

Colombia: Comisaría del Amazonas, Río Caraparaná, El Encanto. "Frondlets 6–8 ft. long or more. Petiole 9–10 ft. long. Tremendous tree, 70 ft. tall. Trunk basally 1½–2 ft. through, smooth. Fruit heavily laden." May 22–28, 1942, *Richard Evans Schultes 3865*.

Bromeliaceae

Navia Lopezii *L. B. Smith sp. nov.*

Herba saxicola, caulescens, scandens, cauli robusto. Folia dense polystiche ordinata, integerrima; vaginis late ovatis, ca. 2 cm. longis, nervatis, atrocastaneis, lucidis; laminis sublinearibus, planis, usque ad 22 cm. longis et 23 mm. latis, basi paulo attenuatis, apice acuminatis et breviter involuto-subulatis, margine angusto cartilagineo brunneo, subtus minute perobscureque albo-lepidotis. Scapus nullus. Inflorescentia in foliorum centro nidulans, densa, e fasciculis paucis paucifloris formata; fasciculorum bracteis exterioribus oblongis, late acutis, quam sepalis subduplo brevioribus. Bracteae florigerae lanceolatae, acuminatae, amplae, sepala superantes, subcoriaceae. Flores sessiles. Sepala libera, linearia, acuminata, 50 mm. longa, subcoriacea, glabra, sepalo anteriore plano posterioribus alato-carinatis incluso. Petala roseo-purpurea (! Schultes), laminis ellipticis, ca. 1 cm. longis, stamina superantibus.

Dr. Smith writes, in connection with his description of *Navia Lopezii:* "This species has flowers more than twice the size of any previously known *Navia*, and the

rose-purple color of its petals appears to be unique in the genus.

"*Navia Lopezii* is named in honor of the late Francisco López whose hard and enthusiastic work as a co-collector with Schultes in the Amazon has enhanced our knowledge of the vast, unknown eastern part of Colombia and adjacent Brazil."

Brazil: Estado do Amazonas, Cerro Dimití, upper Río Negro basin, on rocks. Alt. ca. 300 m. May 12–19, 1948, *Richard Evans Schultes & Francisco López 9956* (Type in U.S. Nat. Herb. No. 1985318).

Navia myriantha *L. B. Smith sp. nov.*

Herba saxicola, caulescens; caule saepe elongato robustoque. Folia densissime polystiche ordinata, subintegra; vaginis parvis, ovatis, saepe vix distinctis, brunneis, subtus dense albo-lepidotis, mox glabris; laminis linearibus, planis, longe acuminatis, basi nullo modo angustatis, plus quam 5 cm. longis, 10–12 mm. latis, subtus et margine lepidibus minutis linearibus patentibus albis vestitis, mox glabris. Scapus gracilis, 40–55 mm. longus, foliis absconditus. Inflorescentia myriantha, verisimiliter simplex, densissime crasseque ellipsoidea, 3 cm. longa. Bracteae florigerae late ovatae, acutae, quam sepala bene breviores, integrae, tenues. Flores sessiles. Sepala libera, linearia, acuta, 10 mm. longa, tenuia, glabra, sepalo anteriore plano posterioribus alato-carinatis incluso. Petala aurea, laminis 3 mm. longis, stamina superantibus.

Concerning this new species Dr. Smith states: "Although its leaf margin is slightly irregular, *Navia myriantha* shows no real teeth, such as all previously described species have. In this character, it is like *N. Lopezii*, but it differs on nearly all other points."

Brazil: Estado do Amazonas, Cerro Dimití, upper Rio Negro basin, on rocks. Alt. ca. 200 m. May 12–19, 1948, *Richard Evans Schultes & Francisco López 9955* (Type in U. S. Nat. Herb. No. 1985317).

Leguminosae

Cassia Tagera *Linnaeus* Sp. Pl. (1753) 376.

In 1854, Spruce collected *Cassia Tagera* at San Carlos, quite probably from the same conspicuous colony which covers the low granite boulders immediately behind the town. Humboldt had also collected it on the upper Orinoco. It is widely distributed in tropical America, but occurs extremely locally in sandy and sterile places.

When I first saw it at San Carlos, I was struck with the peculiar crawling, prostrate, pseudo-rosette habit of the plant. Its extraordinary tolerance of high acidity and extreme xerophytism amazed me even more. Wishing to have the plant tested as a possible cover-crop and sand-binder, I sent a pressed flowering sprig to Dr. Bernice G. Schubert of the Gray Herbarium. Upon learning the identity of the specimen, I returned later to San Carlos and gathered seeds which were sent to Ing. Agrón. George Addison of the Instituto Agronômico do Norte in Belém do Pará, who germinated them and cultivated the plant.

It appears from preliminary cultivation on a small scale that the little plant may be admirably suited for use as a sand-binder on sterile, xerophytic soils, especially on sands of a granitic origin. It grows well in Belém, in spite of persistent attack by a nematode.

Venezuela: Territorio del Amazonas, Río Negro, San Carlos. "Small, crawling rosette plant. Flowers yellow." December 9, 1947, *Richard Evans Schultes & Francisco López 9265*.

Euphorbiaceae

Mabea subserrulata *Spruce ex Bentham* in Hooker's Journ. Bot. 6 (1854) 366.

Apparently hitherto unknown from Colombia, *Mabea subserrulata* was described from material collected by

Spruce at Ipanoré, a point on the Rio Uaupés not far from the Colombia-Brazilian frontier.

Colombia: Comisaría del Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). "Small bush along bank of river. Fruit scarlet." December 13–17, 1947, *Richard Evans Schultes & Francisco López 9393*.

Sapium Aubletianum (*Müell.-Arg.*) *Huber* in Bull. Herb. Boiss., sér. 2, 6 (1906) 362.

Schultes & López 8798C represents a topotypical collection of this rare species of *Sapium*. The type was collected a century ago by Spruce at São Gabriel on the Rio Negro.

Brazil: Estado do Amazonas, Rio Negro, São Gabriel (Uaupés) "Bush." September 19, 1947, *Richard Evans Schultes & Francisco López 8798C*.

Anacardiaceae

Anacardium negrense *Pires & Fróes* in Bol. Técn. Instit. Agron. Norte, no. 15 (1948) 20, t.

The type tree of *Anacardium negrense* is a landmark, an enormous and magnificent tree along the bank of the Rio Negro at the tiny hamlet of São Felipe, below the mouth of the Rio Issana. It is obviously cultivated. The collection from the neighboring locality of São Marcelino (*Schultes & López 9564*) is likewise an isolated tree obviously planted at the site of a hamlet by man. No other trees of this species, so far as I am aware, are encountered along the banks of the Rio Negro, although inhabitants of São Gabriel (Uaupés) state that a very ancient tree of *cajutí*, growing near the present church, was felled twenty or more years ago. In this connection, it is of interest perhaps to point out that this tree may be the one represented by Richard Spruce in his pencil sketch made at São Gabriel in July, 1852, and reproduced in his "Notes of a Botanist on the Amazon and Andes" [ed. A. R. Wallace] 1 (1908) fig. 15, although

to the best of my knowledge Spruce never collected the species.

Meeting such a rare tree, which was, in a way, cared for by man but never seen in the wild, was a challenge. The inhabitants of São Felipe stated that the tree did occur in the wild, but in distant affluents. When I met the tree at São Marcelino, I questioned the Indians then dwelling there and was informed that at the very headwaters of the Igarapé Uabá, emptying into the Rio Negro at São Marcelino on the right bank, the tree grows wild in the forest, that there are many, and that they grow into enormous trees. These people affirm that it is found wild only at the headwaters of creeks to the east of the uppermost Rio Negro. In January, the Igarapé Uabá was too dry to penetrate to its sources, so the joy of seeing *Anacardium negrense* in the wild had to be deferred.

In May, 1948, López and I penetrated to the headwaters of the Rio Dimití, a rather large affluent of the right bank of the Rio Negro to the north of São Marcelino. The lower half of this creek is relatively wide and easily navigated in canoe, but above the mouth of a large creek known as the Yauiyabú it is extremely winding and very narrow, becoming almost impossible for navigation because of obstructions. My notes of this trip give a picture of what we saw: "Here we saw also our first wild *cajutí* [*Anacardium negrense*]. This tree grows in from two to five feet of water in the rainy season, along with *Mauritia minor* (*buritĺ*) and *Mauritiella aculeata* (HBK.) Burret. It is so extremely abundant that the locality or formation is called, curiously, not "buritizal" but "cajutizal." In the dry season, when it drops its fruit, according to natives here, there is an abundance of hunting because the animals converge on the then partially dry swamps to feast upon the fruit. The affluent of the Dimití which goes over towards the Caiaburí

is called Yauiyabú: in linga geral *yauí* is the name of this *Anacardium* and *ya-bú* is river. It is said that the tree is more abundant in the Yauiyabú than in the Dimití itself. The *cajutí* here in the Dimití is a stout tree often attaining a height of 75 feet, but usually less, with a very heavy and spreading crown. It loses its leaves yearly after the fall of the fruit and is now with light green leaves of the new flush — probably coming out in February."

Brazil: Estado do Amazonas, Upper Rio Negro basin, Rio Negro, São Marcelino opposite mouth of Rio Xié. "Low tree with spreading crown; very stout, gnarled trunk. Old leaves very thick, coriaceous. *Cajutí.*" January 5, 1948, *Richard Evans Schultes & Francisco López 9564.* — Estado do Amazonas, Upper Rio Negro basin, Rio Dimití. "*Cajutí.* Medium-sized tree in dense forest, standing in flooded hummocks. Leaves coriaceous." May 12–19, 1948, *Richard Evans Schultes & Francisco López 9976.*

Senefelderopsis *Steyermark gen. nov.*

Arbores vel frutices lactiferi. Stipulae nullae. Folia penninervia integerrima petiolata supra basin limbi maculari-glandulosa. Flores monoici apetali. Discus nullus. Inflorescentiae terminales vel axillares simplices vel paniculatim ramosae. Rami spiciformes, bracteis basi biglandulosis obsiti, e quarum axillis inferioribus flores foeminei 1–2 solitarii, e reliquis flores masculi ternati vel geminati parvi. Calyx masculus 3-partitus imbricatus, foemineo 3-partito imbricato. Stamina 2–3. Ovarii rudimentum nullum. Antherae biramosae, loculis longitrorsum adnatis. Ovarium 3-loculare. Ovula in loculis pendula solitaria. Semina carunculata.

Type species: *Senefelderopsis Croizatii* Steyermark.

This genus combines some of the characters found in *Sapium*, *Sebastiania* and *Senefeldera*. Except for the abundant latex found in all parts of the plant, the deeply 3-parted staminate calyx, the 2–3 stamens of the staminate flower, and the bilobate tips of the style branches,

it might be mistaken for another species of *Senefeldera*. It differs from *Sebastiania* in lacking stipules, leaf blades entire and biglandular at the base, stamens on short filaments and not exserted, and in the stouter, spiciform inflorescences in which the staminate inflorescence has more numerous flowers subtended by each bract. From *Sapium* the genus differs largely in having carunculate seeds (mostly ecarunculate in *Sapium*), a deeply 3-parted staminate calyx (*Sapium* has a 2–3-lobed staminate calyx), and entire leaf margins (*Sapium* has mostly denticulate margins).

Senefelderopsis Croizatii *Steyermark sp. nov.*

Arbor 8–13.3-metralis; ramulis robustis, 5–8 mm. diametro, glabris, apice dense foliatis; petiolis 8–21 mm. longis, glabris; laminis coriaceis, subtus argenteo-albidis, marginibus subrevolutis roseo-purpureis, elliptico-obovatis vel obovatis, apice acutis vel obtusis, basi acutis, 6–13 cm. longis, 2.5–6.5 cm. latis, glabris, penninerviis, costis secundariis utroque 10–12 fere angulo recto patentibus prominentibus e margine 3–5 mm. anastomosantibus, supra basin glandulis 2 obsitis, inflorescentiis 3–4 in apice ramulorum confertis vel in axillis superioribus solitariis, 5–11 cm. longis; pedunculo inflorescentiae 2–2.2 cm. longo; rhachidi crassulo striatulo parce ferrugineo-tomentoso, 2–3 mm. diametro, sulphureo-viridi; inflorescentia mascula: bracteis triangulari-ovatis vel ovato-oblongis, acuminatis vel acutis, 0.5–2 mm. longis, 0.5–1.5 mm. latis, inferne parce ferrugineo-tomentosis, marginibus irregulariter eroso-denticulatis, quam glandulis linearioblongis, nigris, 2–2.5 mm. longis brevioribus; floribus masculis luteis, 6–8 in axillis bractearum sitis; calycis masculi laciniis 3 ovatis, obtusis, 1 mm. longis, 1 mm. latis, extus parce papillatis, marginibus irregulariter obtuse serrulatis; staminibus plerumque 2–3, aliquando 1;

antheris suborbiculari-reniformibus, 0.5 mm. altis, 0.7 mm. latis; filamenti parte libera 0.5 mm. longa; floribus foemineis basi inflorescentiae solitariis sessilibus; calycis foeminei laciniis ovatis, acutis, 1.8 mm. longis, 1–1.5 mm. latis, extus ferrugineo-tomentosis sed marginibus serrulatis glabris; stylis arcuato-recurvato-patentibus, 0.8 mm. longis, apice breviter bilobatis; ovario ferrugineo-tomentoso, 3 mm. longo (Plate XVI).

Senefelderopsis Croizatii is a dominant member of the forest of dwarfed trees and shrubs occurring on the southeastern basal slopes of Carrao-tepuí, and was seen only on this part of the area, really an extension of Ptari-tepuí table mountain. In cutting a trail through the part of the forest where this species occurred on the way up to the summit of Carrao-tepuí, the copious latex would exude abundantly from the stems every time the *machete* was used to cut through overhanging or pendent branches of this species. With the easily cut stems covered by the white latex, it was no effort to spot the trail on the return trip from the summit of this mountain to camp.

VENEZUELA: State of Bolívar, southeastern portion of base of Carrao-tepuí, alt. 1460–1615 m., "tree 25–40 feet tall; one of dominant trees in dwarfed woods; milky latex abundant; trunk straight; leaves coriaceous, deep green above, silvery white below, margins subrevolute; rose-purple; rhachis mustard greenish-yellow; flowers yellow." December 4–5, 1944, *Julian A. Steyermark 60849* (TYPE in Herb. Chicago Nat. Hist. Mus.).

Senefelderopsis chiribiquetensis (*Schultes & Croizat*) *Steyermark comb. nov.*

Senefeldera chiribiquetensis Schultes & Croizat in Caldasia 3 (1944) 122, fig.

This second Colombian species, found in the Department of Vaupés in southeastern Colombia on one of the isolated sandstone mesas, Mount Chiribiquete (or Cerro Comején), in the Upper Apaporis Basin along the Ma-

EXPLANATION OF THE ILLUSTRATION

PLATE XVI. SENEFELDEROPSIS CROIZATII *Steyermark.* Detached branch showing inflorescence and leaves. A, pistillate flower, ten times natural size. B, transverse section through ovary, highly magnified. C, ovule with caruncle, highly magnified. D, staminate flower with stamens removed, showing calyx lobes from within, forty times natural size. E, staminate flower, lateral view, in natural position, thirty times natural size. F, bract at base of staminate flower, twelve times natural size. G, single staminate flower showing stamens and calyx lobes in natural position, thirty times natural size. H, single stamen, forty times natural size.

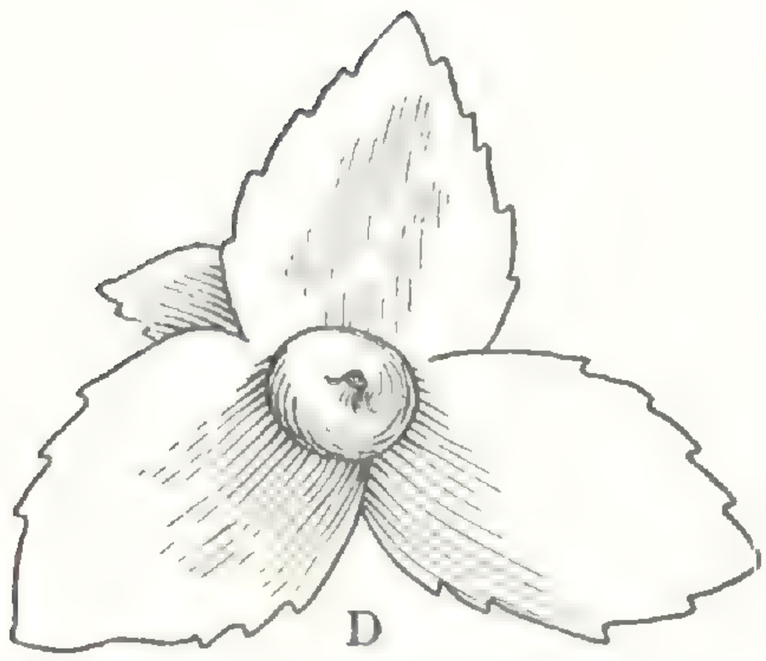
Drawn by DOUGLAS E. TIBBITTS

Plate XVI

A

B

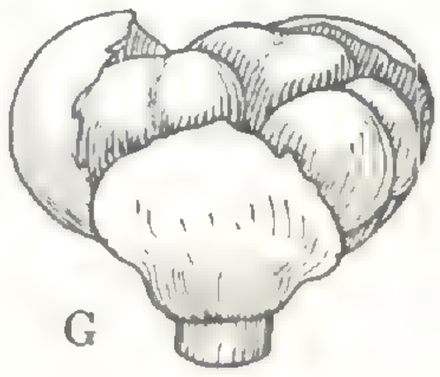
C



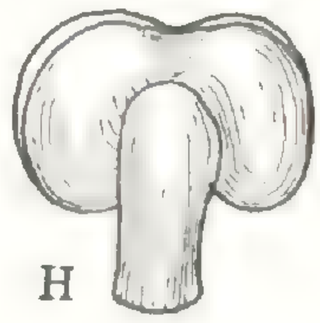
D

E

F



G



H

SENEFELDEROPSIS

Croizatii *Steyermark*

caya River, was originally described under *Senefeldera*. Comparison of the type (*Schultes 5623*) and co-type (*Schultes 5456*) with the Venezuelan material described above indicates that the two are congeneric and that the Colombian species represents a second species in the genus *Senefelderopsis*. The Colombian plant, likewise, yields abundant latex and is a dominant member of the vegetation. The Colombian *S. chiribiquetensis* differs mainly in having more slender inflorescences, shorter, more suborbicular-oblong staminate perianth segments which are rounded at the apex and have more irregularly jagged margins, and in the thinner leaf blades which are pale yellow-green instead of silvery white beneath and obtuse to rounded at the base.

Schultes (l. c.) has given an admirable account of the habitat and ecology of the area frequented by *S. chiribiquetensis*.

Cyrillaceae

Cyrilla racemiflora *Linnaeus* Mant. 1 (1767) 50.

Collections of this species from Amazonian South America are very rare in our herbaria. It was collected by Spruce at San Carlos on the Río Negro in Amazonian Venezuela. It appears to be an Antillean element which, by way of the Guiana highlands, has penetrated the upper Rio Negro area.

Brazil: Estado do Amazonas, Rio Negro basin, middle course of the Rio Curicuriarí. "Bush." January 1948, *Richard Evans Schultes & Francisco López 9718*.

Tiliaceae

Lueheopsis Schultesii *Cuatrecasas sp. nov.*

Arbor parva. Rami badii glabri. Ramuli novelli divaricati-patentes, crasse ferrugineo-tomentosi. Folia simplicia, alterna, petiolata, coriacea, patula, disticha. Petiolus robustus, apicem versus incrassatus, in novellis ramulis

EXPLANATION OF THE ILLUSTRATION

PLATE XVII. LUEHEOPSIS SCHULTESII *Cuatrecasas.* 1, flowering branchlet, one half natural size. 2, flower, one half natural size. 3, stamens, three times natural size. 4, anther showing apical pores, fifteen times natural size.

Drawn by DOROTHY H. MARSH

LUEHEOPSIS *Schultesii*

Cuatrecasas

dense tomentosus, in adultioribus glabrescens, usque ad 14 mm. longus. Lamina elliptico-lanceolata, basi obtusa vel rotundata, apice attenuata acute acuminata, margine integra, 8–17 cm. longa, 3.5–6 cm. lata; supra viridis, juveniles pilis sparsis stellatis praediti, mox glabra, nervis principalibus plusminusve signatis; subtus ferrugineo-tomentosa, pilis arachnoideis intricatis dense obtecta et pilis sparsissimis stellatis intermixtis in principalibus nervis munita, basi triplinervis, costa et nervis duobus lateralibus basilaribus subparallelis valde prominentibus, tertia parte superiore 2–3 nervis secundariis utroque latere adscendentibus marginem versus curvatis, nervis tertiariis exterioribus arcuato-adscendentibus numerosis, 4–9 mm. distantibus, interioribus transversis crebris, venulis minute reticulatis. Stipulae lanceolatae, valde villosae, 12 mm. longae, caducissimae. Inflorescentia pseudopaniculata; flores in ramulis hornotinis foliosis vel aphyllis, valde patulis, dense ferrugineo-tomentosis, in cymulis 1–5 flori pedunculatis dispositi; pedunculis rigidis divaricatis, 1–3 cm. longis, ferrugineo-lanuginosis, bracteis parvis, lanceolatis, caducis, pedicellis rectis, patentibus 6–15 mm. longis, tomentosis. Involucrum 7–9 bracteis ovato-lanceolatis, acutissimis, 14–16 mm. longis utrinque ferrugineo-tomentosis tertia parte inferiore coalitis. Pediculus floralis 1–1.5 mm. longus. Sepala 5, ovato-oblonga, apicem versus angustata, acutiuscula, 20–24 mm. longa, 7–10 mm. lata, extus tomentosa, pilis minutis stellatis densis alliquibus strigonis fasciculatis longioribus intermixtis tecta, intus glabra. Petala subrotundata, alba, 3 cm. longa, basi in unguem angustata, extus puberula, intus glabra. Tubus staminalis 2 mm. altus, crassiusculus, basi glaber, sursum puberulus, apice extus in staminodia numerosa capillaria circa 4 mm. longa tertia parte inferiore densissime setosis producta; intus stamina fertilia crebra pluriseriata inaequilonga ad 7 mm. longa filamen-

tis liberis complanatis basim versus plusminusve pilosis ferens. Antherae 1 mm. longae, oblongo-ellipticae, rectae, basi subcordata sub basim dorso affixae, loculis tertia parte superiore liberis, apice latiore apertis. Ovarium copiosissime hirsuto-setosum. Stylus glaber, rigidus, 5 mm. longus, apice stigmate rugoso-papilloso.

In connection with his description of this novelty, Dr. Cuatrecasas writes: "*Luehcopsis Schultesii* is an interesting new species of this uncommon genus. It is closely related to *Luehcopsis altheaeflora* (Spruce) Burret, but differs from it in its generally divaricate habit, longer petioles, peduncles and pedicels, and especially in the larger flowers which have broader sepals which are much longer than the involucre, and in having very large white petals. The plant is striking, with the bright cinnamon or ferrugineous color of the young branches and leaves beneath, and the spreading young branches bearing large showy flowers."

COLOMBIA: Comisaría del Amazonas, Río Igaraparaná. Los alrededores de La Chorrera. Alt. ca. 180 m. "Small bush. Flowers white. Witoto name: *mo-se-go-na*," June 1942, *Richard Evans Schultes 3925* (TYPE in Herb. Chicago Nat. Hist. Mus.).

BOMBACACEAE

Bombax humile (*Spruce ex Benth.*) *Bentham* in Journ. Linn. Soc. 6 (1862) 108, *nomen impl.*; ex Jackson Index Kew. 1 (1895) 320.

These three collections are apparently the first to be reported since the type. The first two are topotypical. The type was collected by Spruce nearly a century ago, at San Carlos, Venezuela, directly across the Río Negro from the Colombian locality of San Felipe. These collections establish the presence of *Bombax humile* in Colombia.

COLOMBIA: Comisaría del Vaupés, Río Negro, San Felipe (El Castillo), below confluence of Ríos Guainía and Casiquiare. "Large bush

or small tree up to 9 feet tall. Leaves thick papyraceous. Flowers red (petals) and yellow (stamens).'' December 12, 1947, *Richard Evans Schultes & Francisco López 9298.*—Same date and locality, *9336A.*—Comisaría del Vaupés, Río Negro, vicinity of Piedra del Cocuí. December 27, 1947, *Richard Evans Schultes & Francisco López 9488.*—Comisaría del Vaupés, Río Guainía basin, Río Naquieni, vicinity of Cerro Monachi. ''Small tree. Flowers red and yellow.'' June 1948, *Richard Evans Schultes & Francisco López 10050.*

Quararibea muricata *Cuatrecasas sp. nov.*

Arbor parva. Ramuli grisei, rugulosi, juveniles virides, pilis stellatis minutis vestiti. Folia mediocria, membranacea, simplicia, alterna, petiolata, viridia. Petiolus rigidus, 18–24 mm. longus, teres, supra partem dimidiam incrassatus et profunde striato-rugulosus, basi ampliatus, rugulosus, adpresse stellato-tomentosus. Lamina elliptico-oblonga vel ovato-elliptica, utrinque attenuata, apice acuminata, basi obtuse cuneata vel subrotundata, margine integra plana, 16–30 cm. longa, 6–10 cm. lata; supra glabra costa et nervis secundariis prominulis, reliqua laevis nervulis obsoletis; subtus prospectu glabra sed pilis sparsissimis stellatis praecipue ad nervos munita, costa crassiuscula eminenti, nervis secundariis sex latere utroque adscendentibus marginem versus arcuato-anastomosatis, nervis tertiariis transversis prominulis remotis cum venulis minus conspicuis in reticulum laxum anastomosatis. Flores solitarii, oppositifolii, pedunculati. Pedunculi mediocres, rigidi, ad 18 mm. longi, apicem versus sensim incrassati, profunde striolato-rugulosi, dense stellato-tomentosi, luteolo-virides, parte media apiceque bracteam brevem linearem tomentosam 4–8 mm. longam ferentes. Alabastra subturbinata, luteolo-viridia, siccitate lutea, valde muricata, densissime stellato-tomentosa, 18–30 mm. longa, 9–10 mm. lata. Calyx luteolo-viridis, tubulosus, basi conicus, crassus, coriaceus, circa 20 mm. altus, margine lobis 4 rotundatis vel obtusis, 2–4 mm. profundis, extus argutissime irregulariterque tuberculato-

muricatus, densissime pilis crassis stellatis tectus; intus adpresse sericeus. Petala 5, libera, albida, obovato-oblonga, apice rotundata, basim versus in unguem glabrum angustata, 28 mm. longa, 8 mm. lata, extus velutina, pilis stellatis dense obtecta, intus puberula. Staminorum columna crassiuscula, tomentosa, sed basim versus puberula, quam calyx plus duplo longior, 40 mm. longa, extremo in lacinias quinque antheriferas lineares crassiusculas 6–8 mm. longas producta; laciniis sex antherarum loculis ellipticis, 2.5–4 mm. longis, contiguis munitis, sed loculo inferiore (vel duo) parte superiore tubo concrescenti. Stylus erectus, valde exsertus, tomentosus. Stigma papillose capitatum, minute 5-lobatum, paulo incrassatum. Fructus maxime quercui prospectu simillimus. Cupula calycina coriacea, tuberculato-muricata, densissime tomentosa, 2.5 cm. diam., circa 15 mm. alta. Fructus siccitate coriaceo-induratus, minutissime adpresseque tomentosus, ovato-ellipticus, 32 mm. longus, 22 mm. latus, apice minute obtuseque 5-lobatus; pyrenis 5 sublignosis, circa 20 mm. longis, monospermis. Semina oblonga, fusca, circa 18 mm. longa, 5 mm. crassa.

Dr. Cuatrecasas states of this new species: "*Quararibea muricata* is related to *Q. putumayensis* Cuatr., but it is very different from all species in the genus because of its striking calyx, the surface of which is densely covered with strong rugosities and acute tubercles."

Brazil: Estado do Amazonas, Rio Uaupés, between Ipanoré and confluence with the Rio Negro: Tamaquaré, above Bela Vista. "Small tree. Flowers: petals cream, calyx green." November 8, 1947, *Richard Evans Schultes & João Murça Pires 9010* (Type in Herb. Chicago Nat. Hist. Mus.).

Ochnaceae

Elvasia quinquelobata *Spruce ex Engler* in Martius Fl. Bras. 12, pt. 2 (1876) 353.

The type of this curious species was collected by

Spruce along the Río Guainía and the Casiquiare in 1853–54. The collection cited below appears to be the second reported.

Brazil: Estado do Amazonas, Upper Rio Negro basin, Rio Dimití. "Small tree or tall bush on deeply flooded banks. Flowers bright yellow." May 12–19, 1948, *Richard Evans Schultes & Francisco López 9933*.

Guttiferae

(Contributed by Bassett Maguire)

Clusia axillaris *Engler ex Martius* in Fl. Bras. 12, pt. 1 (1888) 413, sect. **Androstylium** *Miquel.*

The following collections represent our knowledge of the range of this species:

Brazil: Estado do Amazonas, São Paulo de Olivença, *Krukoff 8626, 8933*—Rio Solimões, Igarapé, *Fróes 23752*—Igarapé Jandiatuba, *Fróes 23904*.

Peru: Departamento de Loreto, near Iquitos, *Klug 708*.

Venezuela: Territorio del Amazonas, Piedra del Cocuí, Río Negro. "Bush with white flowers." December 22–23, 1947, *R. E. Schultes & F. López 9436*.— São Gabriel do Cachoeira, *Spruce 2159* (Type). —Panuré [Ipanoré] ad Rio Uaupés, *Spruce 2854* (Cotype).

Clusia botryoidea *Maguire sp. nov.*, sect. **Criuva** Bentham & Hooker, subsect. **Eucriuva** *Engler*.

Frutex scandens: caulibus crassis; foliis 15–20 cm. longis, 6–8 cm. latis, oblanceolato-cuneatis, subsessilibus, subcoriaceis, costa crassa ad apicem prope extenta, nervis lateralibus a costa angulo ca. 45° abeuntibus, prominulis, ca. 2 mm. distantibus, nervo collectivo a margine 1–2 mm. remoto; inflorescentia multiflora, botryoidea, 15 cm. longa, ramulis inferioribus 4–5 cm. longis; floribus sessilibus, bracteis navicularibus, lanceolatis, acutis, maximis ca. 1 cm. longis; sepalis 3-jugis, decussatis, exterioribus suborbicularibus, carnosis, 3–4 mm. longis, interioribus orbicularibus, concavis, ca. 8 mm. longis; petalis carnosis, orbicularibus, 6–8 mm. longis; staminodiis

6–8, dentiformibus, 2 mm. altis, 1 mm. latis; ovario 5-loculari, loculo multiovulato; capsula ca. 12 mm. longa, 15 mm. lata, depresso-globosa; stigmatibus 5, triangulo-ovatis, ca. 3 mm. longis, sessilibus, planis, marginibus conniventibus; floribus masculinis non visis.

Clusia botryoidea seems to resemble most closely *C. multiflora* Humboldt, Bonpland & Kunth, but it differs conspicuously in having oblanceolate (rather than obovate) leaves; six (rather than four) sepals; and stigmas sessile on the summit of the ovary (rather than elevated on conspicuous, stout styles).

COLOMBIA: Comisaría del Vaupés, base of Cerro Circasia, Río Vaupés. "Scandent shrub; fruit in clusters, pendent." March 7, 1943, *R. E. Schultes 5847* (TYPE in Herb. N.Y. Bot. Gard.).

Clusia chiribiquetensis *Maguire sp. nov.*, sect. **Euclusia** *Planchon & Triana*, subsect. **Chlamydoclusia** *Engler.*

Frutex vel arbor parvula; ramis crassis, subsucculentis, in sicco angulatissimis; petiolis 2–3 cm. longis, crassis; laminis 6–10 cm. longis, (4) 5–8 cm. latis, suborbicularibus vel late obovatis vel late ovatis, coriaceis, apice obtuso-rotundato vel lato cum acumine brevi, basi rotundata vel oblique subcordata, costa prominenti, nervis lateralibus prominulis sursum curvatis, nervo collectivo a margine 1–2 mm. remoto; inflorescentia masculina terminalis, 1.5–3 cm. longa, 3 (?5)-flora; sepalis 5, exterioribus jugis late suborbicularibus, interioribus petaloideis, orbicularibus, 12–14 cm. longis, scarioso-marginatis; petalis 2–2.5 cm. longis, 1.5–1.8 cm. latis, late obovatis; staminis fertilibus numerosissimis 3-seriatis, filamentis in annulum 3–4 mm. altum connatis, filamentis ca. 1 mm. longis, 0.7 mm. crassis, antheris ca. 3 mm. longis, anguste lanceolatis, muticis, 2-locularibus, marginalibus longitudinalibus dehiscentibus, connectivo lato; inflorescentia foeminea 1 (3)-flora; sepalis 5; staminodiis in annulum

glutinosum 4–5 mm. altum connatis; ovario 5–6 loculari, loculis multiovulatis; fructu ca. 5 cm. longo, late oblongo-elliptico; stigmatibus 2–3 mm. longis, triangularibus, conniventibus, sessilibus; seminibus oblongo-ellipticis, ca. 8 mm. longis, 6 mm. latis, aliquantum compressis, pallidis.

This beautiful species may possibly be restricted to Cerro Chiribiquete, an isolated quartzitic mountain which has yielded a number of endemic plants. It is most closely related to *Clusia viscida* Engler, a species of the same general region, but which has relatively narrow oblanceolate leaves and anthers which are provided with a distinct cusp or awn.

COLOMBIA: Comisaría del Vaupés, Cerro Chiribiquete, Río Macaya. "Shrub." January 1944, *G. Gutiérrez & R. E. Schultes 677* (TYPE in Herb. N.Y. Bot. Gard.).—Comisaría del Vaupés, Cerro Chiribiquete, Río Macaya. "Bush 7–8 feet tall." January 1944, *G. Gutiérrez & R.E. Schultes 679* (COTYPE in Herb. N.Y. Bot. Gard.).—Comisaría del Vaupés Cerro Chiribiquete, Macaya River, Upper Apaporis Basin. "Large scraggly bush 10 feet high; latex yellow, sticky; flowers white; sepals red-purple; xerophytic savanna on sandstone, 400–1200 feet above forest floor, 1300–2100 feet above sea-level." May 15–16, 1943, *R.E. Schultes 5473* [in fruit] (TOPOTYPE).—Same locality, July 24, 1943, *R. E. Schultes 5623* (TOPOTYPE).

Clusia columnaris *Engler ex Martius* in Fl. Bras. 12, pt. 1 (1888) 432, sect. **Pachystemon** *Engler*, subsect. **Omphalanthera** *Planchon & Triana.*

This species had apparently not been collected since the original specimens were obtained by Spruce in the middle of the last century. The abundant material now at hand, from the region of the upper Rio Negro and upper Orinoco in Brazil, Colombia and Venezuela, shows that the species is perhaps one of the most common riverine Clusias of the area. It is a well-marked, though variable, species.

Pistillate material which was unknown to Engler may

EXPLANATION OF THE ILLUSTRATION

PLATE XVIII. (Upper figure) CLUSIA CHIRIBIQUETENSIS *Maguire*. A photograph of the bush from which the collection *R. E. Schultes 5473* was taken.

(Lower figure) DUROIA HIRSUTA (*Poepp. & Endl.*) *K. Schum.* in the forest at Puerto Limón, Río Caquetá, Colombia. The several slender blackish trunks in the center and against which the blow-gun and shot-gun are leaning represent *Duroia hirsuta*. Note that a "natural" clearing accompanies this tree, which is called *solimán*, and which is inhabited by ants.

Photographs by RICHARD E. SCHULTES

Plate XVIII

now be characterized as follows: petals narrowly obovate, white, conspicuously red at the base; staminodal disc or crown 2–4 mm. high, bearing one to several series of apparently circular or tangentially compressed sterile anthers or antheral depressions; in savanna forms, the corona may be obsolete; ovary 5- (6) celled; stigmas ovate, 2–3 mm. long, basifixed and subsessile, connivent, borne on a stylar column ca. 1–3 (4) mm. long; fruit obovate, oblong, ca. 3 cm. long, the endocarp becoming cartilaginous and transversely corrugate (in the manner of *C. purpurea*).

BRAZIL: "Ad São Gabriel do Cachoeira, in fissuris rupium, Alto Amazonas, Brasiliae borealis," *Spruce 1980* (TYPE).—Estado do Amazonas, Rio Cauabury, *Holt & Blake 443*.—Rio Içana, *Pires 695, 696*.—Serra de Tunuí, *Black 48-2696*.—Rio Uaupés, *Schultes & Pires 9052, 9082*.—Rio Negro, *Black 22305*.

COLOMBIA: Comisaría del Amazonas, Río Caquetá, *Schultes 5865*.

VENEZUELA: Territorio del Amazonas, Río Negro, *Schultes & López 9435*.—Río Cuao, *Maguire & Politi 27452, 29037*.—Cerro Sipapo, *Maguire & Politi 28705, 28718*.—Cerro Marahuaca, *Maguire & Maguire 29138, 29142, 29220*.—Cerro Yapacana, *Holt & Blake 701*.

Clusia Gaudichaudii *Choisy ex Planchon & Triana* in Ann. Sci. Nat. sér. 4, 13 (1860) 331, sect. **Phloianthera** *Planchon & Triana*.

Pistillate material of this species has apparently not yet been collected.

BRAZIL: "Ad oram meridionalem flum. Amazonum, ad ostium flum. Solimões," *Spruce 1581* (TYPE) (DUPLICATE TYPE in Herb. N.Y. Bot. Gard.).—Estado do Amazonas, Tapurucuara, middle Rio Negro between mouth of Rio Curicuriarí and Barcellos. "Flowers red," September 26–October 14, 1947, *R. E. Schultes & F. López 8910*.—Estado do Amazonas, Tupurucuara, middle Rio Negro, between mouth of Rios Curicuriarí and Barcellos. "Strangler epiphyte; flowers dark red." September 26–October 14, 1947, *R. E. Schultes & F. López 8926*.—Estado do Amazonas, Paranagua, Teffé, basin of Rio Juruá. "Shrub 18 feet high, on varzea land." *Krukoff 4532*.

Clusia globosa *Maguire sp. nov.*, sect. **Clusiastrum** *Planchon & Triana.*

Arbor parva; ramulis tenuibus, ca. 4 mm. diam.; foliis subsessilibus, 10–14 cm. longis, 4–6 cm. latis, oblanceolatis, subcoriaceis, apice rotundo, basi acuto, costa prominenti, nervis prominulis, nervo indistincto collectivo, a margine ca. 0.5 mm. remoto; inflorescentia 3-flora, pedunculo 1–1.5 cm. longo, pedicellis ca. 1 cm. longis; sepalis 3-jugis decussatis, exterioribus late reniformibus, ca. 4 mm. longis, interioribus 8 mm. longis, 6 mm. latis, oblongis; petalis non visis; ovario 10–12 loculari, loculo multiovulato; fructu globoso, 14–16 mm. alto; stigmatibus rotato-planis, 10–12 cuneiformibus, ca. 4 mm. longis, 2 mm. latis, intramedio sessili, extramedio libero; apice capsulae 2 mm. diam. sine stigmate; floribus masculinis non visis.

Clusia globosa seems to be most closely related to *C. cuneata* Bentham of British Guiana. It differs most conspicuously in its globose fruit with ten or twelve subsessile, half-free, radiant stigmas. In *Clusia cuneata*, the fruit is oblong-ovate, and the sixteen free stigmas are borne on an elongate stylar base.

Colombia: Comisaría del Amazonas, trapecio amazónico, Boiauassú River. November 1945, *R. E. Schultes 6790* (Type in Herb. N.Y. Bot. Gard.).

Clusia insignis *Martius* Nov. Gen. & Sp. 3 (1829–32) 164.

Described from material collected at Manáos, *Clusia insignis* is rather common in the Rio Negro basin. It is registered for the flora of eastern Colombia through the collection cited below.

Colombia: Comisaría del Vaupés, Río Negro, vicinity of Piedra del Cocuí. "Enormous tree 75 feet tall, 18 in. in diameter, columnar. Wood reddish towards centre, yellow-white nearer surface, very hard. Leaves thick. Flowers extraordinarily showy, purple-red, 5 inches

across, smelling like rancid butter. In caatinga.'' December 27, 1947, *Richard Evans Schultes & Francisco López 9520.*

Clusia Lopezii *Maguire sp. nov.*, sect. **Pachystemon** *Engler*, subsect. **Retinostemon** *Planchon & Triana.*

Epiphytica; ramis tenuibus; petiolis 1.5–2 cm. longis, tenuibus, laminis 6–10 cm. longis, 3.5–5 cm. latis, oblanceolatis, rotundatis, chartaceis, in petiolum acutum angustatis, costa ad apicem extensa, nervis lateralibus, prominulis; inflorescentia masculina nutanti, trichotoma, 5–6 cm. longa, 7–9 flora; sepalis 10, 2-jugis, exterioribus late rotundatis, 3 mm. vel minus longis, interioribus 10 mm. longis, imbricatis, reniformi-orbicularibus vel oblongo-orbicularibus, petaloideis, scarioso-marginatis; petalis maturis reflexis, 3–4 mm. longis, 4–5 mm. latis; staminibus marginalibus 4–6 serialibus, fertilibus, interioribus sterilibus, antheris 2-locularibus, thecis terminalibus tangentaliter dehiscentibus; ovario abortivo, in profunde excavatum deposito; floribus masculinis non visis.

No immediate relatives of *Clusia Lopezii* are as yet recognized. It is temporarily best assigned to the ill-defined subsect. *Retinostemon.*

This interesting and handsome species is named for the late Francisco López, field assistant of Dr. Schultes.

Colombia: Comisaría del Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). ''Epiphyte with white flowers; in caatinga.'' December 13–17, 1947, *R. E. Schultes & F. López 9388* (Type in Herb. N.Y. Bot. Gard.).—Comisaría del Vaupés, Río Negro, vicinity of Piedra del Cocuí. ''Flowers white,'' December 27, 1947, *Schultes & López 9473.*

Clusia microstemon *Planchon & Triana* in Ann. Sci. Nat. sér. 4, 13 (1860) 331, sect. **Phloianthera** *Planchon & Triana.*

Schultes 3975 greatly extends the known range of

Clusia microstemon and registers the species from Colombia. It is closely related to *Clusia Gaudichaudii*.

Brazil: "Prope Panuré [Ipanoré] ad Rio Uaupés," October 1852–January 1853, *Spruce 2511* (Type) (Duplicate type in Herb. N.Y. Bot. Gard.).

Colombia: Comisaría del Amazonas, Río Igaraparaná, los alrededores de La Chorrera, alt. about 180 m. "Large strangler without latex; flowers large; petals white, red towards centre; centre of flower deep yellow; flower saucer-shaped." June 4–10, 1942, *R.E.Schultes 3975*.

Clusia opaca *Maguire sp. nov.*, sect. **Criuva** *Bentham & Hooker*, subsect. **Eucriuva** *Engler*.

Arbor parva; ramulis tenuibus, 3–4 mm. diam., internodiis 1–3 cm. longis; foliis dense chartaceis, petiolis 10–12 cm. longis, tenuibus, laminis oblongis vel oblongo-oblanceolatis, 7–9 cm. longis, 2.5–3.5 cm. latis, valde revolutis, apice obtuso, basi obtusa, costa supra prominula, subtus prominenti, nervis lateralibus a costa angulo circa 20° abeuntibus, supra prominulis, subtus prominentibus; inflorescentia solitaria, terminalis, compacta, multiflora, 1.5–2 cm. longa vel saepe nonnullis subterminalibus, axillaribus, bracteolis minutis, late orbicularibus; floribus masculinis subsessilibus, cum jugo parvis, carinatis, bracteolis appropinque subtentis; sepalis 4–5, exterioribus decussatis, 3–4 mm. longis, orbiculari-obovatis, crassissimis, interioribus 2 vel 3, ca. 4 mm. longis, orbicularibus, fere concavis; stamini extrorsis, numerosis, inaequaliter 4–5 seriatis, filamentis in annulum 1–1.5 mm. altum connatis, receptaculo apice concavo, glabro, nonglutinoso, filamentis exterioribus ca. 0.2–0.3 mm. longis, interioribus 0.5–0.7 mm. longis, antheris 0.7–1 mm. longis, oblongis, obtusis, inappendiculatis, pinguibus, incurvatis, lateraliter dehiscentibus; floribus foemineis non visis.

Clusia opaca appears to be associated with those species which centre around the south Brazilian *C. Cambes-*

sedesii Planchon & Triana: hence, it must be placed in the subsect. *Eucriuva*. I am unable, at this time, to recognize any close relatives of this fascinating little species.

Brazil: Estado do Amazonas, path between headwaters of Ira-Igarapé and headwaters of Igarapé Abiú, affluent of Rio Taraíra. "Small treelet; flowers white; very fragrant; in caatinga." Makú Indian name: *paí-nan-ge*. July 4–6, 1948, *R. E. Schultes & F. López 10192* (Type in Herb. N.Y. Bot. Gard.).

Clusia penduliflora *Engler ex Martius* in Fl. Bras. 12, pt. 1 (1888) 412, sect. **Clusiastrum** *Planchon & Triana*, subsect. **Brachystemon** *Engler*.

Schultes 5521, the first collection of *Clusia penduliflora* from Colombia, represents pistillate material in which the fruit is quite mature. The fruit was apparently fleshy, "red," probably ovoid and 2–3 cm. long. Its five small sessile stigmas are considerably disjunct, each stigma ovate, somewhat concave, 3 mm. long and 2 mm. broad. The lower 4 pairs of bracts are small and decussate, the inner 6–7 sepaloid bracts are imbricate, about 10 mm. broad, 8 mm. long, rounded and broadly scarious.

It is interesting to note that each of the three widely separated localities known for *Clusia penduliflora* is associated with local occurrences of cretaceous sandstone or proterozoic granite savannas or caatingas. The floras of elevations along the Río Macaya and at São Paulo de Olivença have many elements in common with that at Ipanoré on the Rio Uaupés.

Brazil: "Prope Panuré [Ipanoré] ad Rio Uaupés, October 1852–January 1853, *Spruce 2792* (Type) (Duplicate type in Herb. N.Y. Bot. Gard.).—Estado do Amazonas. Near Palmares, Sao Paulo de Olivença. "Vine, terra firma, highland." Sept. 11–Oct. 26, 1936, *Krukoff 8324*.

Colombia: Comisaría del Vaupés, vicinity of Cachivera del Diablo and mouth of Río Macaya, alt. 300 m. "Vine with red fruit." May 1943, *R. E. Schultes 5521*.

Clusia Planchoniana *Engler ex Martius* in Fl. Bras. 12, pt. 1 (1888) 431, sect. **Pachystemon** *Engler*, subsect. **Polythecandra** (*Pl. & Tr.*) *Engler*.

Polythecandra Spruceana Planchon & Triana in Ann. Sci. Nat. sér. 4, 14 (1860) 229.

This species, probably not hitherto collected since the time of Spruce, is now recorded for the floras of Colombia and Venezuela. Schultes' specimens provide essentially mature fruit, thus effectively supplementing the original collections.

Brazil: "Prope Sao Gabriel do Cachoeira, ad Rio Negro, Brasiliae borealis," January–August 1852, *R. Spruce 2251* (Type) (Duplicate type in Herb. N.Y. Bot. Gard.).—*R. Spruce 1980.*

Colombia: Comisaría del Vaupés, Río Negro, San Felipe (El Castillo), below confluence of Ríos Guainía and Casiquiare. "Large bush; fruit oblong with sepals and petals persisting, and with 5 triangular remnants of stigmas, $\frac{1}{2}$ cm. each side, elevated; common in caatinga." December 12, 1947, *R. E. Schultes & F. López 9323.*

Venezuela: Territorio del Amazonas, Río Negro, Piedra del Cocuí. "Large bush; fruit green." December 22–23, 1947, *R. E. Schultes & F. López 9445.*

Clusia renggerioides *Planchon & Triana* in Guttifères (1862) 45, sect. **Cordylandra** *Planchon & Triana.*

Engler (Fl. Bras. 12, pt. 1 (1888) 427) cites, in addition to the type of this species, *Spruce 1507* (Rio Negro, prope Manáos). I have seen the following specimens from the basin of the Rio Madeira, Estado do Amazonas, Brazil: *Krukoff 6810, 7212.*

The original and subsequent descriptions of *Clusia renggerioides* lack characterization of the fruit. *Schultes 3940* and the two Krukoff collections are from young and mature fruiting specimens respectively and form the basis of the following description: inflorescence 3–5 flowered, 2–4 cm. long; bracts decussate 10–12 pairs, the outer minute, the inner two pairs sepaloid, crassate, suborbicular, 6–7 mm. long, 5–6 mm. broad, scarious-mar-

gined; petals 5, crassate, obovate, reddish, 8–10 cm. long; staminodia obsolete; immature ovary cylindric; mature fruit pyriform, 5-celled, 12–15 mm. long, ca. 8 mm. broad; stigmas pyramidal, essentially connivent, each stigma triangular or rhomboidal, ca. 2 mm. long; ovules numerous, pluriseriate, subpendent, matrix yellow, seed 1–2 mm. long, reddish.

Recent collections indicate that the species has a great geographical range. Through *Schultes 3940* and *5565*, *Clusia renggerioides* is now recorded for the flora of Colombia.

BRAZIL: Panuré Ipanoré, Rio Uaupés de l'Amazone. *Spruce 2895* (TYPE) (DUPLICATE TYPE in Herb. N.Y. Bot. Gard.).—Near Livramento, Rio Livramento, Humaytá. "Strangling vine, 'apui'; on terra firma." October 12–November 6, 1934, *Krukoff 6810*.—Plateau between Rio Livramento and Rio Ipixuna, Humaytá. "Vine, cipoal." Nov. 7–18, 1934, *Krukoff 7212*.

COLOMBIA: Comisaría del Amazonas, los alrededores de La Chorrera, Río Igaraparaná, alt. ca. 180 m. "Strangler; petals red-purple. June 4–10, 1942, *R. E. Schultes 3940*.—Comisaría del Vaupés, Cerro La Campana, Ajaju River. "Treelet 25 feet tall, diam. 4–5 inches; bark black; latex thin, white, resinous; flowers red-brown; in forests on craggy slopes, (sandstone) summit about 800–1200 feet above forest floor, 1700–2100 feet above sea level." June 1–6, 1943, *R. E. Schultes 5565*.

Clusia Schultesii *Maguire sp. nov.*, sect. **Criuva** *Bentham & Hooker*, subsect. **Eucriuva** *Engler*.

Frutex; ramulis crassis, subsucculentis, in sicco sulcatis; ramulorum internodiis 1–2 cm. longis; foliis 8–12 cm. longis, 5–7 cm. latis, subsessilibus, coriaceis, orbiculari-obovatis, basi aliquantum acuta, margine aliquantulum crassa revolutaque, costa inferne crassa, apice prominulo, nervis lateralibus prominulis, prope marginem nervo collectivo 1 mm. remoto; lamina supra laccata, subtus non lucida; inflorescentia masculina 10–15 cm. longa, 3–9 flora, pedunculo 8–10 cm. longo, 5–6 mm. crasso, ramis 5–10 mm. longis, bracteis semiorbicularibus, ca. 5 mm. longis; sepalis 6–7, inferioribus oppositis

vel omnibus imbricatis, interioribus 6–8 mm. longis, oblongo-orbicularibus; petalis 16–18 mm. longis, 8–10 mm. latis, sine unguiculis; staminibus numerosis, filamentis liberis, 3–5 mm. longis, ca. 0.5 mm. crassis, basi tangentialiter lata, antheris linearibus, muticis vel minute apiculatis 3–4 mm. longis, connectivo lato, thecis lateralibus longitudinalibus dehiscentibus; stigmatibus 5, ovatis, acutis, sessilibus, conniventis, pyramidalibus; fructu 2 cm. longo, valvis 5, explanatis, 2.2 cm. longis.

Clusia Schultesii is obviously most closely related to the Peruvian *C. pseudo-mangle* Planchon & Triana (duplicate type in Herb. N.Y. Bot. Gard.), which has larger and more strongly veined leaves that are not varnished; a smaller inflorescence 6 cm. long; and stamens 3 mm. long.

Clusia Schultesii is certainly one of the most striking species in the genus and apparently is the dominant one on Cerro Chiribiquete.

COLOMBIA: Comisaría del Vaupés, Cerro Chiribiquete, Río Macaya, Upper Apaporis Basin. "Large shrub 12 feet high; flowers white, very fragrant, frequented by many species of insects; xerophytic savanna; on sandstone, 400–1200 feet above forest level, 1300–2100 feet above sea level. July 24, 1943, *R.E.Schultes 5621* (TYPE in Herb. N.Y. Bot. Gard.).—Same locality. "Scraggly shrub 10 feet high; latex white." May 15–16, 1943, *R.E.Schultes 5475* (COTYPE in Herb. N.Y. Bot. Gard.).

Clusia spathulaefolia *Engler* in Fl. Bras. 12, pt. 1 (1888), 412, sect. **Clusiastrum** *Planchon & Triana*, subsect. **Brachystemon** *Engler*.

This species apparently has been known only from the type. Our specimen is a pistillate collection and compares favorably with the description and a photograph of the type specimen at the Vienna Herbarium. The essentially mature fruit of *Schultes 5847* is globose, 12–14 mm. long, six-celled, with the six minute stigmas 1

mm. long and sessile on short stout styles which are well spread apart.

Brazil: In rupibus humilioribus pr. Panuré [Ipanoré] ad Río Vaupés, *Spruce 2782* (Type).

Colombia: Comisaría del Vaupés, savanna at base of Cerro Circasia, alt. 250 m. "Scandent shrub; fruit in pendent clusters." March 7, 1944, *R.E.Schultes 5847*.

Moronobea coccinea *Aublet* Hist. Pl. Guian. 2 (1775) 789, *pro max. parte.*

Collections of *Moronobea coccinea* from Colombia are few. The species is not abundant at the locality of *Black & Schultes 46-369*.

Colombia: Comisaría del Amazonas, caatinga at headwaters of Río Hamacayacu, interior regions of trapecio amazónico between Amazon and Putumayo watersheds, November 1946, *G.A.Black* & *R.E.Schultes 46-369*.

Moronobea riparia *Spruce ex Planchon & Triana* in Ann. Sci. Nat. sér. 4, 14 (1860) 296.

Moronobea riparia was described from *Spruce 3350*, collected along the Casiquiare in 1854. It has possibly not been re-collected until recently. Because of its relatively short and broad leaves, *Schultes 9857* may perhaps be found to represent a distinct variety. *Fróes 21352* and *Schultes & Pires 9060* appear to be the only records of this species from Brazil, while *Schultes & López 9382*, a topotypic collection, is the first from Colombian territory.

Brazil: Estado do Amazonas, Igarapé da Chuva, Taracuá, Rio Uaupés between Ipanoré and confluence with Rio Negro. "Small tree with shaggy black bark; flat crown, and opposite branches at right angles; wood white and soft; flowers greenish white." Nov. 12, 1947, *R.E.Schultes & J.M.Pires 9060*.—Estado do Amazonas, Rio Aiary, region of Rio Negro. "Árvore 12 m., 30 cm., flores olorosas a noite, amarelo verde; resina amarela, abundante." November 7, 1945, *R.L. Fróes 21352*.

Colombia: Comisaría del Vaupés, Río Negro at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). "Storied tree 40 feet tall; bark thick, checked, grey; wood soft, white; very

abundant in caatinga." December 13–17, 1947, *R. E. Schultes & F. López 9382.*

Oedematopus aff. **O. duidae** *Gleason* in Bull. Torr. Bot. Club 58 (1931) 406.

The occurrence on Mount Chiribiquete of this element with Duida affinities once more stresses the phytogeographical relationships of these two cretaceous quartzitic masses.

COLOMBIA: Comisaría del Vaupés, Upper Apaporis basin, Macaya River, Mount Chiribiquete. "Bush, extensive and scraggly, up to 8–10 feet. Trunk stout. Latex weak, white. Fruits green when ripe. On driest, hottest exposure." May 15–16, 1943, *Richard Evans Schultes 5462.*—Same locality and date. "Latex white. Scraggly bush. Fruit green." *R. E. Schultes 5480.*

Oedematopus obovatus *Spruce ex Planchon & Triana* in Ann. Sci. Nat. sér. 4, 14 (1860) 250.

Oedematopus obovatus was described from *Spruce 2803* collected at Ipanoré on the Rio Uaupés. It is apparently new to the flora of Colombia. *Schultes 5515* appreciably extends its known range to the west.

COLOMBIA: Comisaría del Vaupés, Macaya River; vicinity of Cacchivera del Diablo and mouth of River. Alt. about 300 m.? May 1943, *Richard Evans Schultes 5515.*—Comisaría del Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). "Bush. Flowers reddish." December 13–17, 1947, *Richard Evans Schultes & Francisco López 9350.*

Oedematopus octandrus (*Poepp. & Endl.*) *Planchon & Triana* in Ann. Sci. Nat. sér. 4, 14 (1860) 250.

Planchon & Triana cite the type from Peru (*Poeppig 1440*) and two Spruce collections (*2765* and *3321*) from Ipanoré (Rio Uaupés) and the Casiquiare in Brazil and Venezuela respectively. It is now registered from Colombia, from a locality not far from Ipanoré.

COLOMBIA: Comisaría del Caqueta, Río Taraíra, above lowermost rapids. "Small tree. Flowers pink. Latex yellow." July 11, 1948, *Richard Evans Schultes & Francisco López 10201.*

Quapoya peruviana (*Poepp. & Endl.*) *O. Kuntze* Rev. Gen. 1 (1891) 61.

This species is now registered for the Amazonian flora of Colombia.

COLOMBIA: Trapecio amazónico, interior regions of trapecio, between Amazon and Putumayo watersheds. Alt. above 100 m. "Epiphyte. Flowers yellow." October 1945, *Richard Evans Schultes 6762.*

VIOLACEAE

Amphirrhox surinamensis (*Miq.*) *Eichler* in Martius Fl. Bras. 13, pt. 1 (1872) 377.

Amphirrhox surinamensis is known from British and Dutch Guiana and from the Rio Negro basin of Brazil. It is apparently never an abundant plant in the Brazilian part of its range, but occurs rather locally; it is known from Manáos and from São Gabriel where it was collected by Spruce.

BRAZIL: Estado do Amazonas, Rio Negro, base of Serra Uanarí, near São Gabriel. "Bush." October 31, 1947, *Richard Evans Schultes & João Murça Pires 8979.*

FLACOURTIACEAE

Mayna grandiflora (*Spruce ex Eichler*) *R. E. Schultes comb. nov.*

Carpotroche grandiflora Spruce ex Eichler in Martius Fl. Bras. 13, pt. 1 (1871) 437.

This interesting treelet of the upland forests of the upper Río Negro basin has hitherto been known only from Brazil. The type was collected by Spruce at São Gabriel (Vaupés) below the confluence of the Rios Negro and Vaupés. Spruce also collected *Mayna grandiflora* from Ipanoré on the Rio Vaupés.

BRAZIL: Estado do Amazonas, Rio Solimoes, Tonantins. "Matta da terra firme." January 1944, *A. Ducke IAN 149.*

COLOMBIA: Comisaría del Vaupés, Río Negro, vicinity of Piedra del Cocuí. "Treelet 15 feet tall. Fruit greenish, papery-dry. Bark said to be 'strong poison' for rodents and for man. Has odor of winter-

green (the bark)." December 27, 1947, *Richard Evans Schultes & Francisco López 9524*.—Same locality, date and collectors, *9531*.

Combretaceae

Ramatuella argentea *Humboldt, Bonpland & Kunth* Nov. Gen. & Sp. 7 (1825) 253, t. 656.

The type of *Ramatuella argentea* was collected by Humboldt on the upper Orinoco. Spruce re-collected it at the mouth of the Río Guainía (*Spruce 3498*) in 1854. *Schultes & López 9392* is an exact topotype. This tree is not common in the Río Negro basin.

Colombia: Comisaría del Vaupés, Río Negro, Caño Ducuruapo (Igarapé Rana) at confluence of Guainía and Casiquiare. "Medium-sized tree along river's edge. Leaves silvery." December 17, 1947, *Richard Evans Schultes & Francisco López 9392*.

Ramatuella virens *Spruce ex Eichler* in Martius Fl. Bras. 14, pt. 2 (1867) 100.

Ramatuella virens was described by Spruce on the basis of his collection *3758* from the junction of the Río Guainía and the Casiquiare. *Schultes & López 9395* is an exact topotype of this species and would appear to represent the second collection. The leaves of *Schultes & López 9395* are somewhat narrower than in the type specimen.

Colombia: Comisaría del Vaupés, Río Negro, Caño Ducuruapo (Igarapé Rana) at confluence of Guainía and Casiquiare. "Medium-sized tree." December 17, 1947, *Richard Evans Schultes & Francisco López 9395*.

Araliaceae

Didymopanax Morototoni (*Aubl.*) *Decaisne & Planchon* Rev. Hort. IV, 3 (1854) 109.

A widespread (but in Colombia often very localized) species, *Didymopanax Morototoni* is a characteristic component of the low forest associated with the savannahs or caatingas which, in Amazonian Colombia, occur dis-

ruptedly on sandy areas of presumed cretaceous age and which support what appears to be in general a remnant flora. This species is extremely variable in nature, a peculiarity which is strikingly reflected by the material preserved in our herbaria.

In the Río Igaraparaná, *Didymopanax Morototoni* is known as *sacha-uva*. The Witotos of the same area call it *mo-hö-ka*.

Colombia: Comisaría del Amazonas, Río Igaraparaná, los alrededores de La Chorrera. Alt. ca. 180 m. "Medium-sized tree. Flowers white," June 4–10, 1942, *Richard Evans Schultes 3949*.

Didymopanax Spruceanus *Seemann* in Journ. Bot. 6 (1868) 132.

This species is one of the commonest elements of the caatinga-association of the upper Rio Negro basin, but it is rare in collections. *Schultes & López 9380B* appears to be the first collection from Colombian territory. The type was found by Spruce near Ipanoré on the Rio Uaupés.

Brazil: Estado do Amazonas, Rio Negro, Jucabí (at mouth of Rio Curicuriarí) and vicinity. "Tree. Flowers white. In caatinga." January 17, 1948, *Richard Evans Schultes & Francisco López 9631*.

Colombia: Comisaría del Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). "In low caatinga." December 13–17, 1947, *Richard Evans Schultes & Francisco López 9380B*.

Myrsinaceae

Ardisia panurensis *Mez* in Engl. Pflanzenr. IV, 236 (Heft 9) (1902) 95.

The type of *Ardisia panurensis* was collected by Spruce at Ipanoré, a point on the Rio Uaupés not far from the locality of the collection cited below. This species has hitherto been collected in Colombia at the distant locality of Umbría in the Comisaría del Putumayo. It is a rather wide ranging but seemingly rare species,

being known as far southwest in the Amazon as Loreto in Peru.

COLOMBIA: Comisaría del Vaupés, Río Negro, vicinity of Piedra del Cocuí. "Small treelet, 15 feet. Flowers red or white with red stripes (on same inflorescence). On flood-bank." December 27, 1947, *Richard Evans Schultes & Francisco López 9470.*

Conomorpha riparia *R. E. Schultes sp. nov.*

Arbuscula parva, ramulis junioribus dense adpresso-ferrugineo-tomentellis, mox sordide fuscis, denique glabrescentibus. Folia cum petiolis 10–20 mm. (sed plerumque 15 mm.) longis, plusminusve 1 mm. crassis, valde striatis, densissime ferrugineo-tomentellis; lamina chartacea, anguste lanceolata, paulo marginata, apice acuta vel aliquid subapiculata, statu adulto 8.5–10 cm. longa, 2.2–3.8 cm. lata, supra atroviridis et pilis stellatis albis minutissime obtecta et nervis haud conspicuis, subtus omnino sed praecipue nervum centralem versus magnopere densissime atque molliter ferrugineo-stellato-pilosa. Inflorescentiae erectae vel suberectae, strictae, foliis multo breviores, 2–4 cm. longae, densiflorae, usque ad basim florigerae, axi aliquid crassiusculo, sparse scabro-leproso. Flores subsessiles, patentes, plerumque 5 mm. longi, ore 5–6 mm. in diametro, lutei, fragrantes. Sepala ad $\frac{1}{4}$ connata, lobis triangularibus, acutis, 2.3 mm. longis, margine papillosis, extus glanduloso-pilosis. Petala media pro parte connata, lobis ovatis, apice obtusis, margine papillosis, utrinque glandulosis. Stamina petalis breviora, filamentis crassissimis, usque ad 1.2 mm. longis, liberis, quam antheris bene recurvis, 0.6–0.7 mm. longis longioribus. Ovarium lageniforme, lepidotum, stylo cylindrico crasso, usque ad 1.8 mm. longo.

Conomorpha riparia of the uppermost reaches of the Río Negro resembles *C. grandiflora* Mez, a species known only from the middle Río Negro between Barcellos and Tapurucuara. In addition to floral differences, the dense

rusty indumentum on the under surface of the leaf serves to distinguish *Conomorpha riparia* at once from *C. grandiflora*, which has entirely glabrous leaves.

Conomorpha riparia is a slight treelet and, growing on the very edge of the deeply inundated banks, is subject each year to tremendous drowning. The specific epithet refers to its habitat along the banks of the river.

COLOMBIA: Comisaría del Vaupés, Río Negro, at confluence of Ríos Guainía and Casiquiare, Caño Ducuruapo (Igarapé Rana). "Bush. Flowers yellow, fragrant. Along flood-bank." December 13–17, 1947, *Richard Evans Schultes & Francisco López 9347* (TYPE in Herb. Gray).

Cybianthus Duckei *R. E. Schultes sp. nov.*

Arbor parva ut videtur bene frondosa. Ramuli crassiores, prope apicem sparse ferrugineo-lepidoti, cortice stramineo. Folia chartacea, robustiore petiolata (petiolis 15–20 mm. longis, 2 mm. in diametro), elliptica, apice acuta ut videtur, basi cuneata, margine integra et leviter revoluta, plerumque 20–24 cm. longa, 7–8.5 cm. lata, supra atroviridia, subtus pallidiora et minutissime subtessellata, omnino glabra; nervis lateralibus decem ad quattuordecim, subtus prominentioribus. Inflorescentiae multiflorae, laxe bipinnatim paniculatae, foliis subaequales, axibus densiore-ferrugineo-lepidotis; bracteis minutis, 0.7 mm. longis; pedicellis 2–4 mm. longis. Flores (ex collectore) albi et intus leviter rosei, 2 mm. in diametro vel minores. Sepala basi breviter connata, lobis ovatis vel suborbicularibus, apice obtusis, margine irregularibus (sed non pilosis et non crenatis), 1.4 mm. longis, circiter 1 mm. latis; punctis magnis brunneis praeditis. Petala $\frac{1}{4}$ pro parte connata, ovato-lanceolata, apice rotundata, marginem versus valde hyalina, plusminusve 2.5 mm. longa, 1.3 mm. lata, utroque cum duobus maculis rufo-brunneis. Stamina petalorum prope basim, 2 mm. longa, petala paulo superantia; antherae 0.8 mm. longae, 0.5 mm. in diametro; filamenta basi dilatata, crassiora,

EXPLANATION OF THE ILLUSTRATION

PLATE XIX. CONOMORPHA RIPARIA *R. E. Schultes.* 1, flowering branchlets, one half natural size. 2, subtending floral bract, seven times natural size. 3, flowers, four times natural size.

Drawn by DOROTHY H. MARSH

Plate XIX

CONOMORPHA
riparia
R.E.Schultes

EXPLANATION OF THE ILLUSTRATION

PLATE XX. CYBIANTHUS DUCKEI *R. E. Schultes.* 1, flowering branchlet, one half natural size. 2, flower, nine times natural size. 3, bud and partly opened flower, six times natural size.

Drawn by DOROTHY H. MARSH

CYBIANTHUS *Duckei*

R.E. Schultes

Dorothy Marsh

plusminusve 1.6 mm. longa. Ovarium floris staminiferi valde reductum, stylo 0.6 mm. longo.

In Mez' key to *Cybianthus*, the collection cited below traces out to the vicinity of *C. Klotzschii* Mez and *C. multicostatus* Miq. The one is a Venezuelan plant; the other is Brazilian, but no definite locality is known for it.

Cybianthus Duckei may be separated from *C. Klotzschii* by its narrowly elliptic (instead of obovate) leaves, by its smaller flowers which have the lobes of the calyx irregular along the margin (but not pilose or glandulose), the filaments at least twice as long as the anthers and the stamens slightly exserted. From *Cybianthus multicostatus* it can be distinguished at once by the sepals which are not ciliate and by the great difference in the form and size of the stamens.

I am pleased to name this novelty in honor of its collector, Dr. Adolfo Ducke of the Instituto Agronômico do Norte in Belém do Pará. Dr. Ducke, over a period of nearly half a century, has carried on in the Amazon Valley the work begun by Martius and Spruce and has added immeasurably to our knowledge of the flora of this vast area.

Brazil: Estado do Pará, Belém, Bosque Municipal. "Silva non inundabili. Arbuscula floribus albis intus leviter roseis." May 23, 1946, *A. Ducke 1954* (Type in Herb. Gray).

Sapotaceae

Pouteria elegans (*A. DC.*) *Bachni* in Candollea 9 (1942) 197.

Pouteria elegans has been known from three previous collections made in Amazonian Brazil: from Teffé on the Rio Solimões (*Poeppig*) and from Manáos on the Rio Negro and Ipanoré on the Rio Uaupés (*Spruce*).

Brazil: Estado do Amazonas, Rio Negro, Sao Gabriel. "Small tree." September 18, 1947, *Richard Evans Schultes & Francisco López 8786.*

Apocynaceae

Ambelania Lopezii *Woodson sp. nov.*

Frutex: ramulis teretibus, gracilibus, glabris. Folia opposita, elliptica vel obovato-oblonga, anguste acuminata, basi rotundata, 10 15 cm. longa, 3–5 cm. lata, coriacea, glabra, supra dense et elevate venosa, subtus pallidiora ibique venis immersis nervo medio elevato excepto; petiolis ca. 5 mm. longis. Inflorescentiae terminales, plurifloraе; pedunculo ca. 1 cm. longo; bracteis scariosis, minimis; pedicellis ca. 5 mm. longis, glabris. Calycis laciniae ovato-subreniformes, rotundatae, ca. 2.5–3 mm. longae. Corolla speciosa, alba ut dicitur, suaveolens, hypocrateriformis; tubo ca. 2.5 cm. longo, in medio per longitudinem ca. 1 mm. lato, extus glabro, intus dense piloso; lobis oblique obovato-oblongis, rotundatis, ca. 3 cm. longis, patulis. Antherae ca. 7 mm. longae, supra tubi basim insertae, sessiles. Pistillum cum ovario ca. 1 mm. longo et stigmate 1.5 mm. longo.

In connection with his description of *Ambelania Lopezii*, named in memory of the late Francisco López, co-collector of this new species and a native of La Pedrera, not far from the type locality, Dr. Woodson writes: "It is near *Ambelania grandiflora*, but the flowers of *A. Lopezii* are conspicuously more slender, with the calyx about half the size of those of the former species, and the pedicels are much shorter. The leaves of *Ambelania Lopezii*, also, are somewhat smaller than those of *A. grandiflora*, broader at the base, more narrowly acuminate, and more densely veined."

Colombia: Comisaría del Caquetá, Río Taraíra, at second rapids upstream. July 8–11, 1948, *Richard Evans Schultes & Francisco López 10204* (Type in Herb. Missouri Bot. Gard.).

Rubiaceae

Duroia hirsuta (*Poepp. & Endl.*) *K. Schumann* in Pringsh. Jahrb. Wiss. Bot. 19 (1888) 361.

This shrub, recently cited from the Vaupés of Colombia (Schultes in Bot. Mus. Leafl. Harvard Univ. 13 (1949) 309), is known by the name *solimán* in all parts of Amazonian Colombia. The bark is employed by the Indians of the Putumayo to bind on the arms for cicatrization. It contains a principle which blisters the skin, leaving a brown stain which lasts for several months.

As shown in the illustration (Plate XVIII), *Duroia hirsuta*, which usually possesses nodes inhabited by ants, grows in small colonies in the jungle. Where these colonies occur, no other plants, save a few ferns and *Selaginella* can live.

COLOMBIA: Departamento del Cauca, Puerto Limón, bosques en el lado caucano del Río Caquetá. "*Solimán*. Small tree. Bark, when tied on arm, forms blisters." February 28, 1943, *Richard Evans Schultes 3330*.

Duroia petiolaris *Hooker filius* in Martius Fl. Bras. 6, pt. 2 (1889) 364.

It appears that *Duroia petiolaris*, which is not uncommon in the trapecio amazónico, has not hitherto been recorded from Colombia.

COLOMBIA: Comisaría del Amazonas, Río Loretoyacu. "Bush. Flowers white." October 20–30, 1945, *Richard Evans Schultes 6727*.

Retiniphyllum pilosum (*Spruce*) *Mueller-Argoviensis* in Martius Fl. Bras. 6, pt. 5 (1881) 7.

The type of *Retiniphyllum pilosum* was collected by Spruce at San Carlos on the Río Negro of Venezuela. It is a common, though localized, element of the caatingas of the uppermost Río Negro basin of Brazil, Colombia and Venezuela.

BRAZIL: Estado do Amazonas, Rio Negro, Jucabí (at mouth of Rio Curicuriarí) and vicinity. "Bush. Flowers white. Fruit red." January 17, 1948, *Richard Evans Schultes & Francisco López 9633*.

Retiniphyllum speciosum (*Benth.*) *Mueller-Argoviensis* in Martius Fl. Bras. 6, pt. 5 (1881) 10.

The collection cited below matches the type very closely. The type was collected by Spruce near Sao Gabriel, below the confluence of the Rio Uaupés with the Rio Negro. In 1932, Ducke found this species in the nearby Rio Curicuriarí (*Ducke 24020*). *Schultes & Pires 9139* seems to represent the third collection of this endemic to be preserved in our herbaria.

Brazil: Estado do Amazonas, Rio Uaupés, between Ipanoré and confluence with Rio Negro, Serra Wabeesee, left bank below Bela Vista. "Small tree. Flowers red." November 17, 1947, *Richard Evans Schultes & João Murça Pires 9139*.

Retiniphyllum truncatum *Mueller-Argoviensis* in Martius Fl. Bras. 6, pt. 5 (1881) 11.

The collection cited below is a topotype. The type, *Spruce 3131*, was collected at the mouth of the Casiquiare.

Colombia: Comisaría del Vaupés, Río Negro, San Felipe (El Castillo), below confluence of Ríos Guainía and Casiquiare. "Small tree or large bush. Fruit red. Flowers white and red." December 12, 1947, *Richard Evans Schultes & Francisco López 9327*.

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ORCHIDACEAE PERUVIANAE VIII

BY
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THE PRESENT ARTICLE is the eighth in the series pertaining to Peruvian orchids. Beside amplifications, corrections and nomenclatural notes, there are descriptions of new concepts in the genera Lepanthes, Pleurothallis, Liparis and Diothonea.

The order of genera follows that proposed by Dr. Rudolf Schlechter in Notizblatt des Botanischen Gartens und Museums Berlin-Dahlem 9 (1926) 563–591.

Lepanthes longipedicellata *C. Schweinfurth sp. nov.*

Herba parva, caespitosa, saxicola. Caules tenues, pluriarticulati, vaginis hispidis tubulatis cum ostio ovato arctissime obtecti. Folium unicum, ellipticum vel oblongo-ellipticum, plusminusve breviter petiolatum, subtus plusminusve purpureum. Inflorescentiae saepissime plures, quam folium longiores, laxe pluriflorae. Flores perparvi, cum pedicello longo. Sepala late patentia, membranacea. Sepalum dorsale elliptico-ovatum cum parte anteriore caudato-acuminata et recurva, trinervium. Sepala lateralia anguste triangulari-lanceolata, sensim longe acuminata, uninervia, dorso conspicue papillosa. Petala transverse bilobata; lobi perangusti. Labellum generis, trilobatum; lobi laterales comparate magni, dolabriformes; lobus medius minutus, pubescens.

Plant small, caespitose, up to 10.5 cm. tall. Roots fibrous, numerous, relatively stout, apparently thicker than the stems. Stems slender, up to 7 cm. high, entirely concealed by several close, tubular, hispid sheaths which terminate in an ovate marginate hispid mouth. Leaves solitary and erect at the apex of the stem, elliptic to oblong-elliptic, more or less acute with a minutely tridenticulate apex, cuneate-narrowed to a short petiole, green above and more or less purple beneath, up to 3.5 cm. long including the petiole and 1.3 cm. wide, sometimes slightly oblique. Inflorescences one to seven, axillary, suberect to diffuse, generally distinctly surpassing the leaf in maturity, loosely several- (up to 12-) flowered; pedicels spreading-ascending, much surpassing the subtending infundibuliform bract which is just below the emergence of the pedicel. Flowers very small, membranaceous, with widely spreading sepals. Dorsal sepal elliptic-ovate with caudate-acuminate recurved apex, cucullate, 3-nerved, the mid-nerve being carinate without, about 6 mm. long and 2 mm. wide when expanded. Lateral sepals narrowly triangular-lanceolate, gradually long-acuminate, gently recurved above, shortly connate at the base, 1-nerved, conspicuously long-papillose and unicarinate without, about 7 mm. long in natural position and 1.3 mm. wide near the base. Petals much smaller than the sepals, transversely bilobed, about 0.3 mm. long and 3.1 mm. wide; posterior lobe lanceolate-linear, obtuse or subacute; anterior lobe triangular-linear, slightly smaller than the posterior lobe. Lip very small, adnate to the column above the middle, 3-lobed, about 1.5 mm. long and 2.2 mm. wide near the base in natural position; lateral lobes dolabriform with a truncate and thickened outer margin and a slender incurved apex; mid-lobe minute, pubescent. Column about 1.8 mm. high.

This species is outwardly similar to *Lepanthes alticola*

C. Schweinf. and to *L. pubicaulis* C. Schweinf. It differs from the former in having prominently hispid stems and an elongate pedicellate ovary, and from the latter in its loosely flowered inflorescence which more or less surpasses the leaf.

Puno: Prov. of Carabaya, Ollachea (abajo), at 2500 meters altitude, below cliffs, December 30, 1947, *C. Vargas 6939* (Type in Herb. Ames No. 64895).

Lepanthes minutipetala *C. Schweinfurth sp. nov.*

Herba gracilis, muscicola. Caules caespitosi, pergraciles vel filiformes, vaginis arctis tubulatis numerosis cum ostiis ovatis hispidis patentibus omnino obtecti. Folium unicum, terminale, oblongo-ovatum, subabrupte acuminatum cum apice tridenticulato. Inflorescentiae saepissime duae vel tres, racemosae, folio multo breviores, dense bi- vel plurifiorae. Flos perparvus. Sepala late patentia, basi valde connata. Sepalum dorsale triangulari-ovatum, acutum vel breviter acuminatum. Sepala lateralia minora, oblique triangulari-ovata, acuta, per dimidium basalem connata. Petala perparva, transverse suborbiculari-ovalia. Labellum trilobatum; lobi laterales dolabriformi-peltati, parte exteriore pubescenti; lobus medius minutus, bidentatus. Columna gracilis.

Plant slender, growing in thick moss. Roots fibrous, glabrous. Stems caespitose, tall, slender to filiform, about 28 cm. or less high, entirely concealed by numerous close tubular minutely scabrous sheaths which terminate in an ovate marginate hispid mouth. Leaf solitary, terminal, erect or spreading, oblong-ovate, rather abruptly acuminate to a tridenticulate apex of which the middle tooth is longer, cuneate-narrowed to a short petiole below, up to 4.6 cm. long and 1.3 cm. wide, chartaceous when dry, many-nerved with three more conspicuous ribs. Inflorescences terminal, two to three (rarely four), racemose, densely 2- to several-flowered, equaling about half the

subtending leaf or less. Floral bracts minute, loosely infundibuliform, glabrous, apparently dark reddish brown. Flowers very small, glabrous, yellow. Sepals membranaceous, widespreading, deeply connate at the base. Dorsal sepal relatively large, triangular-ovate, acute or short-acuminate, 3-nerved, about 5 mm. long along the mid-nerve and 4.4 mm. wide at the base of the free part. Lateral sepals obliquely triangular-ovate, acute and short-apiculate, with the inner margins connate through the lower half, 1-nerved, about 4.4 mm. long along the nerve and 2.5 mm. wide near the base. Petals very small, transversely suborbicular-oval, broadly rounded or subtruncate above, about 1.2 mm. long and 2 mm. wide. Lip 3-lobed, attached to about the middle of the column by the broad base of the lateral lobes; lateral lobes dolabriform-peltate with linear-lanceolate pubescent outer surface which is about 2 mm. long and rounded at each end; mid-lobe minute, broadly rhombic-ovate, sharply bidentate, pubescent. Column slender, about 1.9 mm. long.

This species appears to have no near allies.

Cuzco: Prov. of Paucartambo, "cordilleras de 3 Cruces," in rainforest, "ceja de la montaña," at 3600 meters altitude, October 10–14, 1943, *C. Vargas 3637* (Type in Herb. Ames No. 64904).

Lepanthes pubicaulis *C. Schweinfurth sp. nov.*

Herba pusilla, caespitosa, epiphytica. Caules pergraciles, vaginis tubulatis aretis pilosis cum ostiis ovatis hispidis omnino celati. Folium unicum, ellipticum vel late ovale, apice subacutum vel obtusum, basi breviter petiolatum. Inflorescentiae racemosae, dense pauci- vel multiflorae, quam folium maxima pro parte breviores. Flores parvi, membranacei. Sepala glabra. Sepalum dorsale ovato-lanceolatum, longe acuminatum. Sepala lateralia valde similia sed paulo minora. Petala transverse bilobata; lobi subaequales, anguste lanceolati. Labellum

columnae parti basali adnatum, apice trilobatum, basi truncato-cordatum; lobi laterales comparate magni, oblique semiovati, apice incurvi; lobus medius minutus. Columna gracilis.

Plant small, epiphytic, caespitose, about 8 cm. high. Roots fibrous, numerous. Stems very slender, erect-spreading, up to 5.6 cm. long, entirely concealed by six to eight close tubular densely pilose sheaths which terminate in an ovate spreading marginate pilose mouth. Leaf solitary, terminal, erect or erect-spreading, elliptic to broadly oval, up to 2.7 cm. long and 1.5 cm. wide (commonly about 2 cm. long and 1 cm. wide), subacute to obtuse at the minutely tridenticulate apex, cuneate below and gradually narrowed to a short petiole, many-nerved with three more prominent nerves. Racemes terminal, axillary, three or four (rarely five), densely 2- to 16-flowered, commonly more or less shorter than the subtending leaf but rarely surpassing the leaf, about 3 cm. or less long including the short naked peduncle, erect or arcuate. Floral bracts subapproximate, infundibuliform. Flowers small, reddish yellow, membranaceous and wide-spreading in anthesis. Sepals glabrous, connate below. Dorsal sepal ovate-lanceolate, long-acuminate, 3-nerved, about 7.4 mm. long and 2.6 mm. wide across the base of the free portion. Lateral sepals similar, ovate-lanceolate, long-acuminate, prominently 1-nerved with a short supplementary nerve, about 7 mm. long along the central nerve and 2.2 mm. wide across the base of the free portion. Petals transversely bilobed with subequal more or less divergent lobes; posterior lobe narrowly lanceolate, gradually narrowed to an obtuse tip, about 3.8 mm. long and 0.7 mm. wide at the base of the free part; anterior lobe about equally large, oblong-lanceolate. Lip adnate to the lower part of the column, broadly triangular-ovate in outline, prominently 3-lobed near the apex, truncate-

cordate at the base, about 2.2 mm. long from the center of the base to the apex of a lateral lobe and 2.6 mm. wide at the base; lateral lobes relatively large, obliquely semiovate, incurved above, obtuse; mid-lobe minute, triangular-ovate. Column slender, shorter than the lip, more or less dilated above.

This little plant resembles *Lepanthes pumila* C. Schweinf. in habit, but not in floral structure. It differs from *L. cassidea* Reichb.f. in its oval leaves and lack of cilia on the petals and lip. It varies from *L. Millei* Schltr. in having densely flowered racemes and dissimilar petals which lack a median lobule.

Cuzco: Prov. of Quispicanchis, Cachubamba, Marcapata, at 2800 meters altitude, December 12, 1943, *C. Vargas 3817* (Type in Herb. Ames No. 65059).

Pleurothallis bicornis *Lindley* Fol. Orch. Pleurothallis (1859) 7, no. 29.

A critical examination of a photograph of the type of this species in the Lindley Herbarium suggests several corrections in the original description.

The leaf appears to be ovate-oblong, rather than "oblong." While this organ is described and shown as "deflexed," that condition seems to be due to the fact that the base of the lamina has evidently been broken and torn from its natural junction with the stem and bent down in the dried specimen. It seems quite evident, also, that the cauline sheath was detached from the stem in the type specimen and that it was pushed up the stem to the origin of the leaf, a condition which is rarely seen in natural specimens.

Several recent Peruvian collections referable to *Pleurothallis bicornis* show the need for a few additional corrections. The leaf, which varies from ovate-oblong to oblong-elliptic, is 9.2–14.7 cm. long (not 17.5 cm. as shown). It is always acute at the apex (not acuminate)

as specified, and is either rounded or very slightly cordate at the base, whereas it was described as "cordate." The petals are noted as acuminate and involute, whereas those in the specimens observed are fleshy-thickened above and usually with an obtuse or subacute apex. The lip, which was described as three-lobed, is really subsimple and broadly ovate, rather than "rhombic" as specified. Moreover, there is a pair of rather prominent calli on the disc.

CUZCO: Prov. of Calca, Vilcabamba, in shrubby thickets at 2700 meters altitude, January 6, 1944, *C. Vargas 3947.*

HUÁNUCO: Mito, at about 2700 meters altitude, on steep southwestern slope, flowers translucent with dark red opaque lines, July 8–22, 1922, *Macbride & Featherstone 1397;* same locality and altitude, ledges on shrubby hillsides, April 8–18, 1923, *J. Francis Macbride 3286.*

Pleurothallis carinata *C. Schweinfurth sp. nov.*

Herba epiphytica, humilis, cum rhizomate repenti. Caules comparate remoti, graciles, unifoliati. Folium oblongo-ellipticum, subacutum vel obtusum, basi late cuneatum, sessile, carnosum. Inflorescentia axillaris, perbrevis, racemosa, biflora ut videtur. Flores lutei, bilabiati. Sepalum dorsale anguste oblongo-lanceolatum, acuminatum, parte anteriore incrassata et leviter recurva. Sepala lateralia in laminam valde concavam, ovato-lanceolatam, acuminatam connata. Petala sepalis multo minora, oblongo-lanceolata, acuta, super medium minute serrulata, trinervia cum nervis lateralibus intus carinatis. Labellum petalis subaequale, oblongo-ovatum, cum lobis lateralibus triangularibus parvis erecto-incurvis. Columna gracilis; clinandrium dentatum.

Plant epiphytic, rather small. Rhizome creeping, entirely concealed by close scarious imbricating sheaths, with roots which are fibrous, glabrous, elongate, simple. Stems about 2 cm. apart, 5.5–6 cm. tall, 1- or 2-jointed, ascending from the base which is subparallel to the rhi-

zome, 1-leaved at the apex, not broadened above, with two or three imbricating tubular, scarious sheaths through the lower half. Leaf erect, fleshy-coriaceous, oblong-elliptic, subacute to obtuse, sessile at the broadly cuneate base, about 8.4 cm. long and 2.15 cm. wide. Inflorescences one or two, very short, axillary, loosely racemose and 2-flowered above, subtended below by a small inconspicuous spathe; rachis about 2 cm. or less long. Flowers dark yellow, bilabiate. Dorsal sepal narrowly oblong-lanceolate, acuminate, concave below with a fleshy recurved upper portion, 3-nerved, about 1 cm. long when expanded and 2.7 mm. wide. Lateral sepals connate into a deeply concave ovate-lanceolate lamina which is narrowed to the shortly bidentate apex, 6-nerved, bluntly bicarinate on the back, and about 9.5 mm. long and 5.6 mm. wide below when expanded. Petals much smaller than the sepals, oblong-lanceolate, acute, somewhat dilated unequally on each side at the base, minutely serrulate above the middle, prominently 3-nerved with the lateral nerves carinate on the inner surface above the middle, about 5.1 mm. long and 1.4 mm. wide (slightly wider at the very base). Lip a little shorter than the petals, oblong-ovate, abruptly acute and apiculate, with obscurely denticulate anterior margins, broadly truncate at the base, fleshy, 3-nerved, about 5 mm. long and 2 mm. wide, provided on each side below the middle with a small erect, porrect, triangular lobule which is serrate above; disc shortly bicarinate above the middle. Column slender, lightly arcuate, about 4.8 mm. high at the back, terminating in a deeply dentate wing and basally produced into a short foot.

This species is very similar to *Pleurothallis ciliata* Knowl. & Westc., but has a different 3-lobed lip. The bicarinate petals are remarkable, this character suggesting the specific name.

Cuzco: Prov. of Quispicanchis, Murayacu, Marcapata, at 1300–1600 meters altitude, December 12, 1943, *C. Vargas 3757* (Type in Herb. Ames No. 63358).

Pleurothallis carnosifolia *C. Schweinfurth sp. nov.*

Herba humilis, inconspicua. Caules caespitosi, breves, unifoliati, vaginis pluribus tubulatis omnino obtecti. Folium erectum, oblanceolatum vel anguste ellipticum, carnosissimum, in siccitate saepissime conduplicatum, acutum vel subacutum, sessile. Inflorescentiae axillares, fasciculatae, racemosae, perlaxe pauciflorae, quam folium saepissime longiores. Flores pro planta grandes. Sepala lineari-lanceolata, acuminata, acuta, dorso conspicue carinata. Petala sepalis similia sed minora. Labellum parvum, simplex, in positu naturali leviter recurvum, cum lateribus basalibus erectis, expansum lanceolato-ovatum, acutum, basi rotundatum. Columna perparva, in pedem producta.

Plant low, inconspicuous, up to 8 cm. tall. Roots numerous, fibrous, glabrous. Stems caespitose, short, unifoliate at the apex, entirely concealed by about five imbricating tubular sheaths, up to about 3 cm. tall. Leaves erect, oblanceolate or narrowly elliptic, very fleshy, usually conduplicate in the dried specimen, acute or subacute, gradually narrowed to a sessile base, up to 5.5 cm. long and from 1 to 1.4 cm. wide. Inflorescences axillary, fascicled, racemose, four to seven, filiform, commonly longer than or subequaling the leaf, very loosely 3- to 5-flowered. Flowers large for the plant, fleshy, yellow and coffee-color, campanulate. Sepals conspicuously carinate without. Dorsal sepal linear-lanceolate, long-narrowed to an acute apex, concave below, 3-nerved, about 9.5 mm. long and 2.6 mm. wide. Lateral sepals very similar, about 9.5 mm. long and 2.2 mm. wide. Petals similar to the sepals but smaller, linear-lanceolate, acuminate, 1-nerved, locally erose-dentate, about 7.6

mm. long and 1.8 mm. wide. Lip small, simple, lightly arcuate-recurved with erect sides and about 4 mm. long in natural position, lanceolate-ovate, acute, rounded at the base, 3-nerved and 1.3 mm. wide when expanded, minutely cellular-pubescent. Column small, denticulate at the truncate apex, about 2.1 mm. high at the back, extended in front at a right angle into a prominent fleshy foot.

This species is allied to *Pleurothallis citrina* Schltr., but has larger flowers and a dissimilar lip.

Cuzco: Prov. of Urubamba, Salapunco (kil. 84), at 2400 meters altitude, on rocks growing with moss, March 25, 1946, *C. Vargas 5989* (Type in Herb. Ames No. 63356).

Pleurothallis caudatipetala *C. Schweinfurth* in Bot. Mus. Leafl. Harvard Univ. 10 (1942) 175, pl. 22, figs. 5–8.

A recent and more fully developed collection of this little species shows several vegetative differences from the apparently juvenile type originally described.

The caespitose plants are about 3–3.5 (not 1.5 cm. or less tall, as specified). Leaves larger than noted, up to 15 mm. long. Inflorescences much surpassing the leaf (instead of shorter than or subequaling the leaf), loosely racemose, up to 11-flowered (rather than 1- to few-flowered). Flowers more glabrous than those of the type. Although no notes of the color are given, all but the basal portion of the sepals and petals is dark purplish in the dried specimen.

Cuzco: Prov. of Urubamba, Machupicchu, at 2040 meters altitude, on rocks, April 16, 1943, *C. Vargas 3367*.

Pleurothallis crateriformis *C. Schweinfurth sp. nov.*

Herba epiphytica, caespitosa, mediocris. Caules patentes, graciles, vaginis tribus arcte tubulatis pubescen-

tibus ornati. Folium late ovatum, abrupte acutum, basi profunde cordatum. Inflorescentiae abbreviatae, unifiorae, unicae vel plures. Flores parvi, bilabiati. Sepalum dorsale perlate ovatum, acutum. Sepala lateralia in laminam angustiorem oblongo-ovatam omnino connata. Petala lanceolato-linearia, leviter recurva. Labellum ovatum, profunde concavo-saccatum vel crateriforme, basi cordatum, caverna marginibus latis planis utrinque circumdata. Columna subgeneris, crassa, abbreviata.

Plant epiphytic, caespitose, medium-sized. Roots fibrous, numerous, glabrous. Stems spreading, slender, often with a decumbent base, up to 14.5 cm. high, provided with about three close tubular evanescent sheaths which are densely fine-pubescent, the lower two being small and imbricating and the upper one separated and much longer. Leaf horizontally spreading or more or less reflexed, broadly ovate, deeply cordate at base with overlapping lobules, abruptly acute with a minutely tridenticulate apex, up to 8.7 cm. long from the apex to the tip of a basal auricle and 5 cm. wide. Inflorescences abbreviated, 1-flowered, one to several, in the axil of an evanescent conduplicate spathe. Flowers small, bilabiate, dark red outside with the inner side of the sepals and petals pale brown with dark red lines. Sepals sparingly pubescent without. Dorsal sepal round-ovate, acute with a minute incurved point, with three prominent veins on either side of the double central vein, about 8 mm. long and 6.9 mm. wide. Lateral sepals entirely connate into an oblong-ovate concave obtuse lamina which is 6-nerved and about 8.5 mm. long and 4.2 mm. wide in natural position. Petals lanceolate-linear, gently recurved, gradually narrowed to a subacute apex, 1-nerved, about 6.6 mm. long and 1.1 mm. wide below. Lip simple, ovate, deeply concave-saccate, subacute with a minute incurved point, cordate at the base, the cavity being surrounded

on each side by a broad fleshy flattened margin, about 4 mm. long and 3 mm. wide. Column stout, abbreviated.

This species is distinctive in its perplexing section of the genus Pleurothallis by reason of several floral characters. The dorsal sepal is much broader than the lamina of the fused lateral sepals and the deeply concave or bowl-shaped lip (which suggests the specific name) appears to be extraordinary.

JUNÍN: Prov. of Tarma, Agua Dulce, at 2000 meters altitude, on a tree in low highland forest, March 17, 1948, *F. Woytkowski 35487* (TYPE in Herb. Univ. Calif.; ISOTYPES in Herb. Ames and in Herb. Mo. Bot. Gard.).

Pleurothallis cyathiflora *C. Schweinfurth sp. nov.*

Herba epiphytica, crassa. Caules approximati, arcuati, uniarticulati, apice unifoliati. Folium unicum, breviter petiolatum; lamina oblongo-elliptica, apice basique rotundata; petiolus parvus, canaliculatus. Inflorescentia solitaria, folio subaequalis vel longior, flexuoso-suberecta, dense multiflora. Bracteae conspicuae, infundibuliformes, patentes. Flores parvi, late cyathiformes. Sepalum dorsale suborbiculari-ovatum, valde concavum. Sepala lateralia paulo longiora et angustiora, libera vel semiconnata, oblongo-ovata, infra concava. Petala elliptico-oblonga vel late oblonga, apice truncato vel late rotundato. Labellum in positu naturali oblongum et tubulari-concavum, expansum trilobatum et rhombico-obovatum, basi cuneatum, apice perlate rotundatum; lobi laterales semiobovati; lobus medius transverse elliptico-oblongus; discus callis duobus brevibus supra et callo semilunari infra ornatus. Columna parva, in pedem latum carnosum producta.

Plant rather stout, epiphytic. Stems approximate, arcuate, about 20 cm. or less long, 1-jointed above the middle, with a close tubular evanescent sheath at the joint. Leaf solitary, ascending, shortly petioled; lamina

oblong-elliptic, rounded at base and apex, up to 12.5 cm. long and 3.8 cm. wide; petiole short, channelled, about 1 cm. or less long. Inflorescence solitary, subequaling or exceeding the leaf, densely many-flowered above, enclosed at base by a conduplicate spathe about 2.4 cm. or less long. Floral bracts conspicuous, spreading, infundibuliform. Flowers reddish yellow, with spreading segments. Sepals minutely cellular-ciliate. Dorsal sepal suborbicular-ovate, deeply concave, rounded to subacute at the apex, 3-nerved, about 7 mm. long and 5 mm. wide when expanded. Lateral sepals semiconnate or free, oblong-ovate, abruptly subacute, slightly oblique, concave below, about 7.8 mm. long and 4.3 mm. or less wide. Petals elliptic-oblong or broadly oblong, truncate to broadly rounded and bluntly subacute at the apex, 3-nerved, about 5 mm. long and 3 mm. wide. Lip oblong and tubular-concave with upcurved sides in natural position, 3-lobed and rhombic-obovate when expanded, cuneate below, 3-nerved, about 4.2–4.5 mm. long and 4 mm. wide when spread out; lateral lobes shallowly semiobovate; mid-lobe transversely elliptic-oblong; disc with a fleshy callus on each side just within the sinus between the lobes and with a lower semicircular callus near the concave base. Column small, somewhat dilated below, about 3.4 mm. high at the back, produced into a stout broad fleshy foot.

This species is allied to *Pleurothallis Vargasii* C. Schweinf., but differs markedly in its more slender stems, narrower leaf, solitary inflorescence, glabrous sepals and the details of the lip.

Cuzco: Prov. of Paucartambo, Pillahuata, at 2800 meters altitude, January 25, 1945, *C. Vargas 4957* (Type in Herb. Ames No. 63340).

Pleurothallis frutex *Schltr.* var. **robusta** *C. Schweinfurth var. nov.*

Herba habitu robustiore, caulibus minus ramosis cum ramis strictis, foliis majoribus, floribus majoribus atque labelli parte anteriore majore a specie differt.

Plant large and stout, up to over 33 cm. high (the longest stem incomplete in our specimen). Stems caespitose, strict, one-branched and often superposed with shorter members above, about 7-jointed or less, entirely concealed by more or less elongate close and imbricating tubular sheaths which are densely pilose when young, about 23 cm. or less long, the branches often very short. Leaves solitary at each terminal joint of the stem or branch, elliptic-lanceolate to narrowly oblong-lanceolate, acuminate with an acute mucronate apex, cuneate at the sessile base, commonly rigidly erect and coriaceous, up to 17.1 cm. long and 2.3 cm. wide, the uppermost leaves (on the branches) much smaller. Inflorescences axillary, glomerate, densely many-flowered. Flowers dark brown, campanulate, with the segments recurved above. Dorsal sepal lanceolate, acuminate with an acute apex, 5-nerved near the base with the lateral nerves branched, about 1.52 cm. long and 4.2 mm. wide. Lateral sepals similar, obliquely lanceolate, connate toward the base, about 1.47 cm. long when expanded and 4.2 mm. wide across the base of the free portion. Petals somewhat longer than the dorsal sepal, from an obliquely ovate-lanceolate base contracted into a narrowly linear cauda which is acute at the tip, 3-nerved, about 1.92 cm. long and 2.9 mm. wide below. Lip much shorter than the other segments, arcuate-recurved below the middle, 5 mm. long in natural position, very shortly clawed, broadly oblong in outline when viewed from above, rounded in front with irregularly dentate-erose margins and an erect-spreading tooth on each side in the middle of the somewhat narrower basal half; disc through the lower part with a pair of erect fleshy recurved keels. Column minute, about 3

mm. high at the back, produced at a right angle into a stout subequally long foot.

The variety differs from the type in being a more robust plant with strict few-branched stems, commonly much larger leaves, differently colored flowers and a lip having a relatively larger anterior portion.

Cuzco: Prov. of Paucartambo, Pillahuata, at 3400 meters altitude, epiphyte in rain-forest, "ceja de montana," December 11, 1942, *C. Vargas 3007* (Type in Herb. Ames No. 63338).

Pleurothallis graciliscapa *C. Schweinfurth sp. nov.*

Herba epiphytica, caespitosa, pro sectione pusilla. Rhizoma repens ut videtur. Caules pergraciles, suberecti vel paulo flexuosi, apice unifoliati. Folium late patens, ovatum vel oblongo-ovatum, basi valde cordatum, saepissime acuminatum. Inflorescentiae abbreviatae, fasciculatae, uniflorae. Flores perparvi, bilabiati. Sepalum dorsale elliptico-ovatum vel oblongo-ovatum, concavum, trinervium. Sepala lateralia in laminam late ovatam profunde concavam connata. Petala linearia, leviter falcato-decurva, margine leviter erosa. Labellum oblongo-ovatum, valde carnosum, apice minute acutum vel apiculatum, basi cordatum, trinervium. Columna abbreviata.

Plant epiphytic, caespitose, up to 15.5 cm. high. Rhizome apparently creeping (only a fragment remains). Roots fibrous, filiform, glabrous. Stems very slender, about 4–13.2 cm. long, erect to irregularly flexuous, furnished at the base with one or two long close, tubular, evanescent sheaths and with a similar longer one below the middle. Leaf solitary, sessile, commonly horizontally spreading, ovate or oblong-ovate, deeply cordate at base (when mature), acute or acuminate with a minutely tri-denticulate apex, 2.8–4 cm. long from the apex to the tip of the basal auricles, 1.1–1.7 cm. wide, chartaceous in the dried specimen. Inflorescences abbreviated, 1-flowered, about five or less. Flowers very small, bilabi-

ate, pale yellow. Sepals ringent, glabrous. Dorsal sepal elliptic-ovate or oblong-ovate, concave, obtuse or subacute, 3-nerved, 4–4.2 mm. long, 2–2.2 mm. wide. Lateral sepals entirely connate into a broadly ovate or round-ovate lamina which is deeply concave, 4-nerved, 3–3.9 mm. long and about 2.3 mm. or less wide when expanded. Petals linear, widespreading, lightly falcate-decurved, obtuse or subacute, 1-nerved, with irregular or minutely erose margins, about 2.6 mm. long and 0.5 mm. wide at the base. Lip oblong-ovate, very fleshy, minutely acute or apiculate, cordate at base, minutely erose, 3-nerved with the termination of the mid-nerve dilated and prominent beneath, about 2.1 2.6 mm. long from a basal auricle to the apex and 1.4 1.6 mm. wide at the base. Column stout, abbreviated, characteristic of the genus.

This little species is allied to *Pleurothallis juninensis* Schltr., but is much smaller throughout and lacks the prominently narrowed sepals of that concept. It suggests *P. magnipetala* C. Schweinf. (see below), but has horizontally spreading leaves and relatively smaller and minutely erose petals.

Huánuco: Tingo María, epiphyte at 670 meters altitude, October 29, 1948, *J. B. Carpenter 103* (Type in Herb. Ames No. 65447).

San Martín: on cliffs on top of slope east of Tingo María, at 625–1100 meters altitude, October 30, 1949–February 19, 1950, *H. A. Allard 20820*.

Pleurothallis hirsutissima *C. Schweinfurth sp. nov.*

Herba pusilla, epiphytica, caespitosa. Planta omnino (radicibus exceptis) dense hirsutissima. Caules breves, graciles, apice unifoliati, vaginis paucis tubulatis arctis dense hirsutis omnino vestiti. Folium ellipticum vel elliptico-oblongum, sessile, acutum vel obtusum, omnino dense hirsutum, coriaceum. Inflorescentiae breves, fas-

ciculatae, paucae ut videtur, uniflorae. Ovarium praesertim densissime longe-hirsutum. Flos pro planta magnus. Sepala extus dense hirsuta. Sepalum dorsale triangulari-lanceolatum, in partem superiorem filiformem apice carnoso-clavatam extensum. Sepala lateralia plusminusve connata, utrumque semiellipticum, subacutum. Petala oblique et anguste lanceolata, sepalo dorsali similia. Labellum panduratum, acutum; lobi laterales prope basim late ovato-triangulares, acuti; lobus terminalis late obovatus, acutus, margine lacerato. Columna arcuata, supra dilatata et trilobata.

Plant small, slender, with an abbreviated rhizome. Roots fibrous, glabrous, numerous. Stems caespitose, widely spreading, slender, usually 2-jointed, up to 4.5 cm. long, entirely concealed by two to four close tubular densely hirsute sheaths. Leaf solitary, usually more or less erect, elliptic to elliptic-oblong, sessile, acute or obtuse, densely hirsute on both surfaces, up to 3.9 cm. long and 1.3 cm. wide, finely spotted with purple or brownish beneath. Inflorescences abbreviated, fascicled, one to five, 1-flowered. Mature ovary ellipsoid-cylindric, very densely long-hirsute. "Flower translucent pale green with purple marks and dots." Sepals densely hirsute without. Dorsal sepal triangular-lanceolate, narrowed into a purple filament which is clavate and fleshy-thickened at the apex, 5-nerved, lightly concave, about 10.2 mm. long and 3 mm. wide near the base. Lateral sepals more or less connate, semielliptic and incurved, concave, 5-nerved with an additional short outer nerve, subacute, about 9 mm. long and 3 mm. wide in the middle. Petals obliquely and narrowly lanceolate, acuminate and produced into a purple filament which is fleshy-thickened and clavate at the apex, 3-nerved, about 8.3 mm. long and 2 mm. wide below, with the margins above the basal portion minutely cellular-ciliate. Lip pandurate, about

5 mm. long and 2.6 mm. wide near the base and apex, acute, 3-nerved, with a pair of obliquely ovate-triangular incurved sharply acute lobules near the base; terminal portion broadly obovate with lacerate margins; disc adorned with numerous dense papillae and with a pair of keels extending from the middle of the lateral lobules (where they are broad and flat) to above the middle. Column small, arcuate, dilated above, with an irregularly 3-lobed and dentate apex, about 3.6 mm. high at the back.

This species differs from the Costa Rican *Pleurothallis pilosissima* Schltr. in having shorter broader leaves, narrower lateral sepals and a dissimilar lip.

JUNÍN: Prov. of Tarma, Agua Dulce, at 1800 meters altitude, rare, epiphyte among mosses on a tree in tall forest, March 15, 1948, *F. Woytkowski 35475* (TYPE in Herb. Ames No. 65977; ISOTYPE in Univ. Calif.).

Pleurothallis juninensis *Schltr.* var. **angustifolia** *C. Schweinfurth var. nov.*

Haec planta foliis angustis, oblongis vel linearibus cum basi late cuneata vel rotundata vel subcordata a typo differt.

Plant caespitose. Stems numerous, 4.5–15 cm. high, unifoliate. Leaf erect or horizontally spreading, oblong or lanceolate-oblong to linear, more or less narrowed to a tridenticulate apex, broadly cuneate to rounded or subcordate at the base, 4.3–8.5 cm. long, up to 1.4 cm. wide, more fleshy in consistency than usual in the type. Flowers similar to those of the typical form, but with slightly shorter and broader sepals.

HUÁNUCO: Yanano, at about 1800 meters altitude, epiphyte on mossy tree, May 13–16, 1923, *J. Francis Macbride 3847* (TYPE in Herb. Field Mus. 534910; ISOTYPE in Herb. Ames No. 60946).

JUNÍN: Chanchamayo Valley, at 1200 meters altitude, August 1929, *Carlos Schunke 1123*.

Pleurothallis magnipetala *C. Schweinfurth sp. nov.*

Herba parvula, gracilis. Rhizoma probabiliter repens. Caules subapproximati, filiformes, apice unifoliati, vaginis duabus tubulatis arcte obtecti. Folium saepissime abrupte reflexum, anguste ovatum, profunde cordatum, supra angustatum, apice minute tridenticulato. Inflorescentiae axillares, abbreviatae, fasciculatae, uniflorae. Flores perparvi, bilabiati. Sepalum dorsale oblongo-ovatum, subacutum, concavum. Sepala lateralia in laminam late ovatam concavam connata. Petala pro subgenere magna, oblongo-lanceolata vel lineari-elliptica, acuta, sepalis lateralibus subaequilonga. Labellum carnosum, parvum, anguste ovato-triangulare. Columna brevissima, carnosa.

Plant small, slender, subcaespitose, up to 11.5 cm. high. Roots numerous, fibrous, glabrous, simple, about as thick as the stems. Rhizome abbreviated, creeping. Stems subapproximate, filiform, 1-leaved at the apex, apparently 1-jointed below the middle, shortly decumbent at the base and arcuate at or near the apex, about 11 cm. or less long, with two close tubular sheaths (one at the base and the other longer one below the middle). Leaf narrowly ovate, deeply cordate at base, usually abruptly reflexed or widespreading, gradually narrowed above to an obtuse or subacute minutely tridenticulate tip, 4.3–5.1 cm. long from the apex of the lamina to the tip of a basal auricle, up to 1.8 cm. wide, chartaceous. Inflorescences axillary, abbreviated, consisting of numerous 1-flowered stems. Flowers very small, bilabiate, orange-yellow. Dorsal sepal oblong-ovate, subacute, concave, 3-nerved, about 4.3 mm. long and 2 mm. wide. Lateral sepals connate into a broadly ovate concave lamina which is minutely bidentate at the tip, about 3.5 mm. long and 2.5 mm. wide, prominently 2-nerved. Petals

large for the subgenus, oblong-lanceolate or linear-elliptic, acute, normally 1-nerved, about 3.5 mm. long and 1 mm. or more wide, entire or locally minutely erose. Lip fleshy, narrowly ovate-triangular, shallowly cordate at the base, acute or subacute, 3-nerved, about 2.5 mm. long in greatest length and 1.5 mm. wide at the base. Column very short and stout.

This species, which belongs to a large and perplexing group of *Pleurothallis*, appears to be quite new to Peru. The relatively large petals are distinctive, as well as the generally sharply reflexed leaves.

Cuzco: Prov. of Quispicanchis, Hda. Itío, Marcapata, in stony or rocky open places, at 2000 meters altitude, January 27, 1943, *C. Vargas 3128* (Type in Herb. Ames No. 63357).; Prov. of Quispicanchis, Cadena, epiphyte at 1020 meters altitude, July 29–30, 1946, *C. Vargas 6221.;* Prov. of Paucartambo, S. Pedro to S. Isabel, at 1350 meters altitude, on old tree trunks, flowers dull yellow, December 6, 1947, *C. Vargas 6784.*

Pleurothallis pantasmoides *C. Schweinfurth sp. nov.*

Herba epiphytica, crassa. Caules leviter arcuati, basi teretes, supra sensim dilatati et sursum conspicue bialati, cum centro in folii partem basalem prominenter extenso. Folium rigide erectum, elliptico-oblongum, obtusum, basi cuneatum cum lateribus in caulem decurrentibus. Inflorescentiae axillares, decurvae, perbreves, circa quattuor, pauciflorae. Flores parvi, carnosi, extus pubescentes. Sepalum dorsale oblanceolato-oblongum, late obtusum. Sepala lateralia in laminam breviorem suborbicularem connata. Petala minora, lanceolato-rhombica, apice late truncata vel truncato-retusa, supra minute denticulata. Labellum carnosissimum, in positu naturali arcuato-recurvum, ovatum ut videtur, apice late rotundatum. Columna parva, arcuata, supra abrupte alato-dilatata.

Plant stout, epiphytic, up to 34 cm. tall. Rhizome

(only a fragment in our specimen) woody. Roots fibrous, glabrous, elongate, slender, mostly simple. Stems lightly arcuate, 23–25.5 cm. long, 1-jointed near the terete base, 4-angled below, gradually dilated and ancipitous-bialate above, with the middle part extending up about 2 cm. into the lamina of the leaf. Leaf solitary, rigidly erect, elliptic-oblong, obtuse, cuneate below with the sides decurrent on the stem, about 10 10.5 cm. long in the center, 3.1–3.6 cm. wide, coriaceous. Inflorescences rising from the summit of the stem above the base of the leaf, very short, arcuate-recurved, few (about four), densely few-flowered. Floral bracts loosely infundibuliform and spreading, scarious. Flowers small, fleshy, densely fine-pubescent on the ovary and outer surface of the perianth, reddish wine-color. Dorsal sepal oblanceolate-oblong, broadly obtuse, 3-nerved, about 8.7 mm. long, 3–3.2 mm. wide. Lateral sepals connate into a suborbicular lamina which is slightly bidentate at the broadly rounded apex, 6-nerved, more or less ciliolate, about 6 mm. long in the middle and 7.2 mm. wide when expanded. Petals smaller than the sepals, lanceolate-rhombic, broadly truncate or truncate-retuse at the apex, minutely denticulate except below the middle, lightly arcuate, 1-nerved and thickened through the middle, about 4 mm. long and 2.1 mm. wide across the middle. Lip very fleshy and arcuate-recurved in natural position, apparently ovate, the sides of the basal portion being erect with indistinct shallowly rounded lobules, about 3.5 mm. long in natural position, 3-nerved, broadly rounded in front, cuneate at the sessile base; disc with two indistinct fleshy ridges in the middle ones on each side. Column small, arcuate, slender below, with a pair of relatively large semiorbicular, denticulate, porrect auricles above, about 3.5 mm. high at the back.

This species seems to be rather closely allied to two

Central American orchids, *Pleurothallis pantasmii* Reichb. f. and *P. circumplexa* Lindl. In general appearance it more nearly resembles *P. pantasmii*, but differs in having much larger flowers with a pubescent ovary and truncate-tipped petals. It varies from *P. circumplexa* in having leaf-blades that are usually narrower, larger flowers and dissimilar broader petals.

Cuzco: Prov. of Paucartambo, Yanamayo-Tambomayo, at 1800 meters altitude, May 4, 1947, *C. Vargas 6499* (Type in Herb. Ames No. 65152).

Pleurothallis retusiloba *C. Schweinfurth sp. nov.*

Herba epiphytica, mediocris. Caules saepissime fasciculati, vaginis tubulatis duabus vel tribus ornati, apice unifoliati. Folium breviter petiolatum: lamina elliptico-oblonga, apice late obtusa et minute bilobulata, basi late cuneata. Inflorescentiae folia plusminusve superantes, dense multiflorae. Flores perparvi, membranacei. Sepala conspicue carinata, acuta. Sepalum dorsale valde concavum, oblongo-ovatum, acutum. Sepala lateralia fere usque ad medium connata, sepalo dorsali similia. Petala circiter duplo breviora, oblongo-cuneata, apice oblique subtruncata vel leviter retusa, trinervia. Labellum minus, trilobatum, cum lobis lateralibus semiobovatis et lobo medio subquadrato et leviter retuso. Columna minuta, in pedem carnosissimum extensa.

Plant epiphytic, medium-sized. Rhizome apparently shortly creeping, woody. Roots fibrous, glabrous, slender, numerous. Stems in fascicles of two or three, enveloped at the base by two or more stout tubular imbricating sheaths, or more rarely solitary and 2–3 cm. distant, straight to lightly flexuous or arcuate, about 9–14 cm. long, provided with two or three remote tubular sheaths of which the upper one equals or surpasses the apex of the stem. Leaf solitary, ascending, short-petioled; lamina elliptic-oblong, lightly retuse-bilobulate at the rounded

apex, broadly cuneate at the base, 6–7.2 cm. long, about 2 cm. wide, coriaceous, with the mid-nerve prominent beneath; petiole short, sulcate, 5–10 mm. long. Inflorescences one or two, more or less surpassing the leaf, densely many-flowered, suberect to arcuate, about 9–14 cm. long, subtended by a conduplicate spathe up to 1.5 cm. long. Floral bracts very small, approximate, infundibuliform, acute. Flowers small, nodding, secund, campanulate, about 5 mm. long, membranaceous, on pedicellate ovaries which barely surpass the bracts. Sepals prominently carinate without, glabrous but with involute ciliolate margins. Dorsal sepal strongly concave, oblong-ovate, acute, 3-nerved, about 4.7 mm. long and 2 mm. wide when expanded. Lateral sepals connate into an ovate-oblong concave lamina which is 6-nerved and divided almost to the middle into a pair of ovate-lanceolate acute lobes, about 4.7 mm. long and 2.5 mm. wide. Petals much smaller than the sepals, oblong-cuneate, obliquely subtruncate to lightly retuse at the apex, 3-nerved, about 2.3 mm. long and 1.2 mm. wide above. Lip very small, tubular-concave in natural position, when expanded rather deeply 3-lobed, five-angled in outline, about 1.5 mm. long and 1.75 mm. wide, cuneate at the base, 3-nerved; lateral lobes semiobovate, spreading; mid-lobe subquadrate in outline, about half as long as wide, shallowly retuse in front; disc with an obscure transverse thickening near the base. Column minute, about half as long as the petals, with a prominent fleshy foot.

This species seems to be allied to *Pleurothallis trilineata* Lindl., but differs in having strongly connate lateral sepals, truncate petals and a retuse mid-lobe of the lip.

Cuzco: Prov. of Paucartambo, Pillahuata, at 3000 meters altitude, epiphyte in rain-forest, December 12, 1942, *C. Vargas 3030* (Type in Herb. Ames No. 65174).

Pleurothallis semipellucida *Reichb.f.* var. **grandiflora** *C. Schweinfurth var. nov.*

Herba floribus multo majoribus et comparate laxioribus a specie differt.

Plant large, tall, epiphytic. Stem suberect, about 38.3 cm. high. Leaf solitary, widespreading, ovate, apparently acute (imperfect at the apex), broadly rounded or subcordate at the sessile base, about 18.7 cm. long and 8.5 cm. wide. Inflorescences two, nearly twice as long as the leaf, flexuous-suberect, rather loosely many-flowered, clasped at the base by an inconspicuous conduplicate spathe about 3.5 cm. long. Flowers secund, bilabiate, much larger than those of the typical form, yellow, with widely spreading segments. Dorsal sepal elliptic-ovate, acute, 3-nerved, about 1.1 cm. long and 5.8 mm. wide. Lateral sepals entirely connate into a suborbicular-ovate deeply concave acute lamina which is about equally long with the dorsal sepal and about 7.4 mm. wide when expanded. Petals linear, acuminate, very fleshy, lightly incurved, about 9.5 mm. long and 0.9 mm. wide. Lip very small, transverse, abruptly reflexed in the middle, lightly 3-lobed, about 2.5 mm. long and 5 mm. wide; lateral lobes obliquely semiorbicular, convex, spreading; mid-lobe semiorbicular-ovate, abruptly acute or mucronate. Column very short and stout, dilated above and below.

This concept is vegetatively closely similar to typical *Pleurothallis semipellucida*, but differs rather strikingly in having somewhat looser racemes of much larger flowers.

Cuzco: Prov. of Convención, "alturas de Pintobamba," at 2700 meters altitude, March 2–3, 1943, *C. Vargas 3243* (Type in Herb. Ames No. 60044).

Pleurothallis tenuifolia *C. Schweinfurth sp. nov.*

Herba epiphytica, caespitosa, mediocris. Caules approximati, graciles, unifoliati, vaginis tubulatis arctis

tribus ornati. Folium lineare, apice abrupte obtusum vel rotundatum, basi anguste et indistincte petiolatum. Inflorescentia saepissime unica, laxe multiflora. Flores mediocres, flavi. Sepala similia, intus superne minute pubescentia. Sepalum dorsale lineari-lanceolatum, supra longe angustatum. Sepala lateralia oblique lineari-triangularia vel lineari-lanceolata, longe acuminata, basi mentum conspicuum formantia. Petala multo minora, anguste cuneato-oblonga, leviter obliqua, apice cucullato rotundata. Labellum in positu naturali arcuato-recurvum, expansum anguste obovato-oblongum, prope medium utrinque levissime constrictum (igitur subpanduratum), basi sensim angustatum, apice rotundatum; discus bicarinatus. Columna parva.

Plant epiphytic, caespitose. Rhizome abbreviated. Roots numerous, fibrous, glabrous. Stems approximate, slender, up to 13.5 cm. tall, provided with three close tubular evanescent sheaths of which the two lower are shorter and imbricating and the upper one larger and separate. Leaf solitary, erect or erect-spreading, linear, abruptly obtuse to rounded at the apex with a minute apicule, gradually narrowed below to an indistinct petiole, 7.5–12 cm. long, up to 1 cm. wide, generally with revolute margins (especially in the lower portions) in the dried specimen. Inflorescence commonly solitary (occasionally two rachises are present on one stem), erect to arcuate or flexuous, loosely many-flowered, shorter than or exceeding the subtending leaf, up to about 17 cm. long. Flowers yellow with a white column. Sepals free or connate at the very base, recurved-spreading above, finely pubescent within in the upper part, 3-nerved. Dorsal sepal linear-lanceolate, long-narrowed to an acute or subacuminate tip, concave below, about 1.3 cm. long and 2.6 mm. wide across the concave lower portion. Lateral sepals obliquely linear-triangular or linear-lanceo-

late, long-acuminate, concave below, forming a prominent mentum with the column-foot, about 1.3 cm. long and 2.8 mm. wide near the base. Petals narrowly cuneate-oblong, lightly oblique, rounded at the cucullate apex, 3-nerved with the mid-nerve marked by a conspicuous thickening on the back about 5 mm. long and 1.6 mm. wide near the apex. Lip arcuate-recurved in natural position, when expanded narrowly obovate-oblong in outline, very lightly constricted on each side near the middle and thus subpandurate, gradually narrowed toward the base, broadly rounded at the apex, up to 5.9 mm. long and 2 mm. wide near the apex; disc with two short parallel keels near the middle. Column small, lightly arcuate, concave in front, about 3.9 mm. long at the back, 3-lobed at the apex with the lateral lobes acutely dentiform and the mid-lobe relatively large, retuse and coarsely dentate, produced at the base into a conspicuous upcurved foot.

This species differs from the Bolivian *Pleurothallis amblyopetala* Schltr. in having much longer stems and leaves and ecarinate pubescent sepals. It varies from the Venezuelan *P. meridana* Reichb.f. in the form of the petals and lip.

JUNÍN: Prov. of Tarma, Agua Dulce, at 2000 meters altitude, on a tree in low highland forest, "Stalks slightly purplish. Leaf exceedingly thick and hard. Stem brownish at base," March 8, 1948, *F. Woytkowski 35432* (TYPE in Herb. Univ. Calif.; ISOTYPES in Herb. Ames and in Herb. Mo. Bot. Gard.).

Liparis laticuneata *C. Schweinfurth sp. nov.*

Herba mediocris, decumbens cum rhizomate longe repenti, foliis raris ornata. Caulis superior foliosus. Folia petiolata; lamina ovata vel lanceolato-ovata, acuta vel acuminata, basi late cuneata vel subcordata; petiolus canaliculatus, basi tubulari caulem amplectenti. Racemus subdense multiflorus. Flores pro genere parvi. Sepala petalaque reflexa. Sepala similia, oblongo-lanceolata,

lateralia paulo latiora. Petala linearia vel lanceolato-linearia. Labellum flabellato-cuneatum, apice late rotundato leviter retusum et mucronatum, latius quam longius. Columna minuta, crassa.

Plant medium-sized, decumbent with a stout long-creeping rhizome which bears leaves at intervals of 4–7.5 cm. and very scattered simple fibrous roots. Stem gradually continued from the rhizome, erect above, leafy, about 20 cm. long up to the base of the peduncle. Leaves distinctly petioled; lamina ovate or lanceolate-ovate, acute or acuminate, broadly cuneate to subcordate at the base, up to 5.5 cm. long and 3 cm. wide; petioles stout, channelled, with slightly dilated tubular sheathing bases, about 2.5 cm. or less long. Inflorescence erect, about 13 cm. long; peduncle short, naked, about 2.7 cm. or more long; racemes subdensely many-flowered; floral bracts narrowly triangular-lanceolate, acuminate, up to 1.1 cm. long. Flowers small, "pale yellow-greenish." Sepals and petals reflexed, with revolute margins in natural position. Dorsal sepal lanceolate-oblong, subacute to abruptly obtuse, about 6–6.6 mm. long and 1.8 mm. wide. Lateral sepals similar, oblong-lanceolate, subacute, slightly oblique, about 6–6.6 mm. long and 2.2 mm. wide. Petals linear or lanceolate-linear, abruptly truncate and minutely retuse at the apex, 6.3–6.9 mm. long and 1 mm. wide near the base. Lip flabellate-cuneate, rather abruptly dilated from a very short cuneate base, lightly retuse and bluntly mucronate at the broadly rounded apex, with the anterior margins irregularly crenulate-dentate, about 7–8 mm. long in the middle and 10–13 mm. wide; disc with a central thickened band extending through the middle. Column minute, stout, about 1–1.2 mm. high at the back.

This species apparently lacks any close ally. It is vegetatively similar to *Liparis brachystalix* Reichb.f. and florally very like *L. elegantula* Kränzl.

Cuzco: Prov. of Convención, "alturas de Pintobamba," at 2700 meters altitude, epiphyte or terrestrial in humus in wet forest, March 4, 1943, *C. Vargas 3264* (Type in Herb. Ames No. 65057).

Liparis ramosa *Poepp. & Endl.* var. **Rusbyi** (*Rolfe*) *C. Schweinfurth comb. nov.*

Liparis Rusbyi Rolfe in Bull. N.Y. Bot. Gard. 4 (1907) 454.

Subsequent examination of Bolivian and Peruvian specimens referable to *Liparis Rusbyi* has convinced me that it differs from *L. ramosa*, represented by numerous Peruvian collections, by only a few constant characters. While the plant described as *L. Rusbyi* appears to be somewhat larger throughout, the most notable difference is in its larger flowers. The sepals of *L. ramosa* are about 8 mm. or less long, while those of *L. Rusbyi* are 10–11 mm. long. A more fundamental discrepancy, however, lies in the lip. In *L. ramosa* this organ is more or less subquadrate-obovate with a rounded to subcordate lower portion above the acute base and is about 7–9 mm. in length. In *L. Rusbyi* the lip is obovate or oblong-obovate to oblong-oval and is about 11–13.6 mm. long.

It appears, therefore, that it is advisable to recognize the plant with the relatively large flowers that have a lip with a more or less cuneate base (described as *Liparis Rusbyi*) as a well-marked variety of the older *L. ramosa*.

Hexisea bidentata *Lindley* var. **imbricata** (*Lindl.*) *C. Schweinfurth comb. nov.*

Diothonea imbricata Lindley Sert. Orch. (1841) t. 40, fig. 1.

Epidendrum oppositifolium A. Rich. & Gal. in Ann. Sci. Nat. ser. 3, 3 (1845) 21, no. 46.

Diothonaea oppositifolia Reichenbach filius in Linnaea 22 (1849) 842.

Euthonaea imbricata Reichenbach filius in Bot. Zeit. 10 (1852) 772.

Euthonaea oppositifolia Reichenbach filius in Bot. Zeit. 10 (1852) 772.

Hexisea imbricata Reichenbach filius in Walp. Ann. 6 (1862) 470.

Hexisea oppositifolia Reichenbach filius in Walp. Ann. 6 (1862) 470.

A careful examination of *Hexisea bidentata*, supplemented by a drawing of this concept from the Lindley Herbarium, together with numerous collections reasonably referred to this concept, has convinced me that it should be regarded as distinctly separable from the concept described as *Diothonea imbricata* Lindl. and *Epidendrum oppositifolium* A. Rich. & Gal. The point of separation of these closely similar forms lies in the lip. In *Hexisea bidentata* the lip is adorned at the base with a more or less distinct thickening, whereas in *Hexisea imbricata* the lip has a well-marked bicarinate callus at the base. In numerous specimens referred to the latter concept, the lip is prevailingly flat with more or less involute sides, as shown by the drawing of the type of *Diothonea imbricata* (l.c.).

This variety is recorded from Mexico, throughout Central America to Panama and from Colombia and Peru.

Diothonea exasperata *C. Schweinfurth sp. nov.*

Herba epiphytica, tenuis. Caulis gracilis, laxus, simplex vel paulo ramosus, vaginis tubulatis arctis omnino celatus. Folia disticha, linearia vel lineari-lanceolata, apice abrupte rotundata et apiculata, basi sessilia. Racemus terminalis, pendulus, brevis, subdense multiflorus. Flores minores. Sepala appendicibus conspicuis dorso praedita. Sepalum dorsale elliptico-lanceolatum. Sepala

lateralia majora, oblique ovato-lanceolata. Petala linearia vel lanceolato-linearia, leviter subfalcata. Labellum basi semigloboso-dilatatum et columnae alis valde adnatum; lamina pandurato-subquadrata, apice retusa vel bilobata, basi breviter tricarinata. Columna omnino bialata.

Plant epiphytic, slender, lax. Stem slender, simple or sparingly branched, subereet to arcuate-flexuous, entirely concealed by close tubular leaf-sheaths, about 31 cm. or more long (incomplete in our specimen). Leaves (remaining only on the upper sheaths) distichous, numerous, narrowly linear to lanceolate-linear, abruptly rounded and apiculate at the apex, scarcely narrowed at the sessile semiamplexicaul base, up to 8.5 cm. long and 5 mm. wide, chartaceous. Inflorescence terminal, nodding, short, racemose, with the slender rachis about 2.5 cm. long; raceme rather densely 9-flowered; floral bracts narrowly triangular-lanceolate, about one half as long as the pedicellate ovary. Flowers rather small, pinkish white, with spreading segments. Dorsal sepal elliptic-lanceolate, subacute, 3-nerved, with numerous prominent uncinate appendages on the outer surface, about 9.5 mm. long and 3.5 mm. wide. Lateral sepals ovate-lanceolate, very oblique, acute, semiorbicular-dilated at the base in front, with numerous prominent subconical appendages on the outer surface, about 11 mm. long and 5.4 mm. wide near the base. Petals linear or lanceolate-linear, abruptly acute, lightly subfalcate, 3-nerved, with minutely erose margins, about 10 mm. long and 2.2 mm. wide near the base. Lip slightly exceeding the sepals, strongly adnate to the wings of the column at the complanate-semiglobose base, about 12.8 mm. long in greatest length; lamina pandurate-subquadrate, retuse to bilobed in front, broadly cuneate below, with denticulate-erose margins, about 8.8 mm. wide across the basal portion; disc with a short tricarinate callus at the base, the

central keel being much reduced below. Column short, stout, about 5.8 mm. high at the back, prominently winged throughout with the wing on each side gradually dilated from the apex to the base of the column where it is adnate to the basal sac of the lip.

This species appears to be distinct from all of the other members of its genus by reason of the muricate or subconical appendages on the back of the sepals and by the subquadrate-pandurate lip.

Cuzco: Prov. of Paucartambo, Pillahuata, "epifita, rara; periantio rosa-pálido, blanquecino, transparente, exteriormente 'mamillate,' " January 25, 1945, *C. Vargas 4953* (Type in Herb. Ames No. 63135).

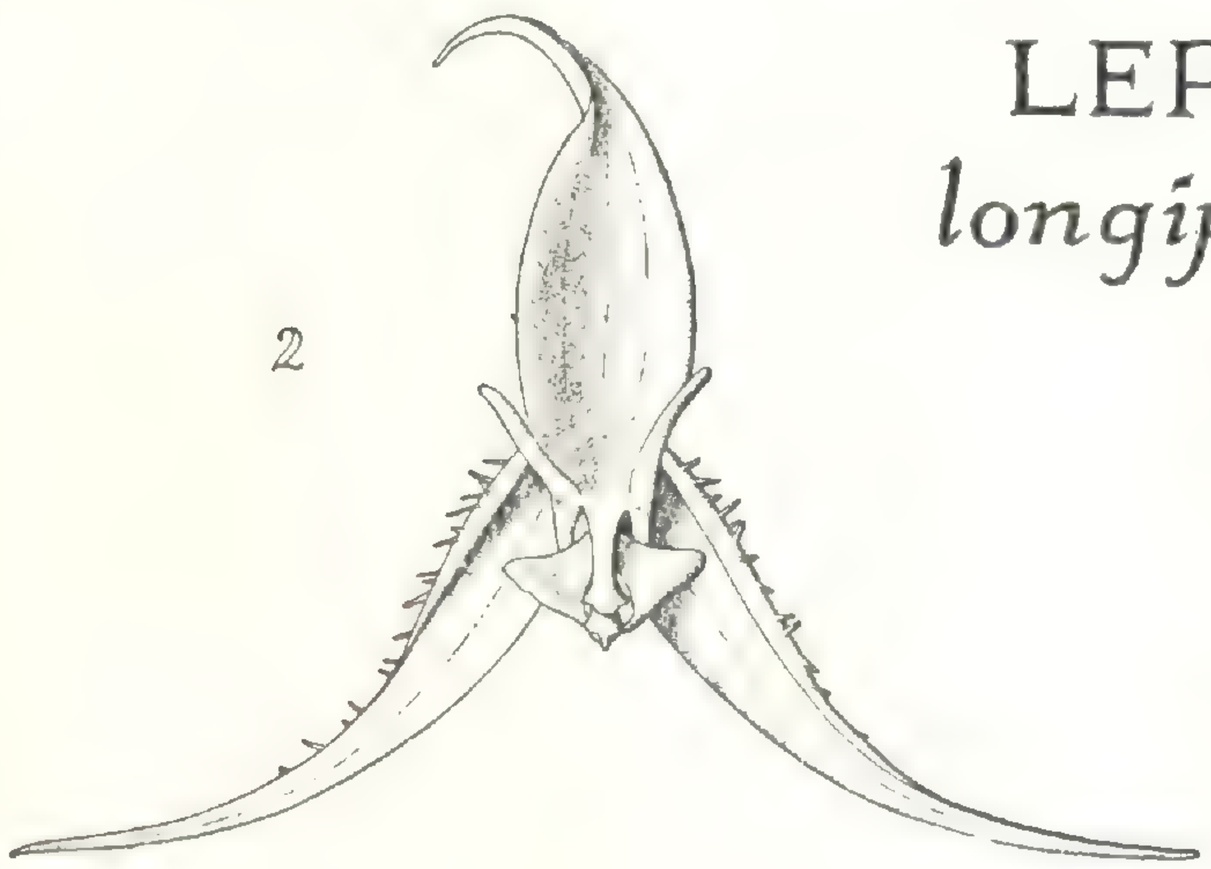
ILLUSTRATIONS

EXPLANATION OF THE ILLUSTRATION

PLATE XXI. LEPANTHES LONGIPEDICELLATA *C. Schweinfurth*. 1, plant, natural size. 2, flower partially expanded, five times natural size. 3, lip, fifteen times natural size. 4, petal, fifteen times natural size.

Drawn by DOROTHY H. MARSH

LEPANTHES *longipedicellata* C. Schweinf.



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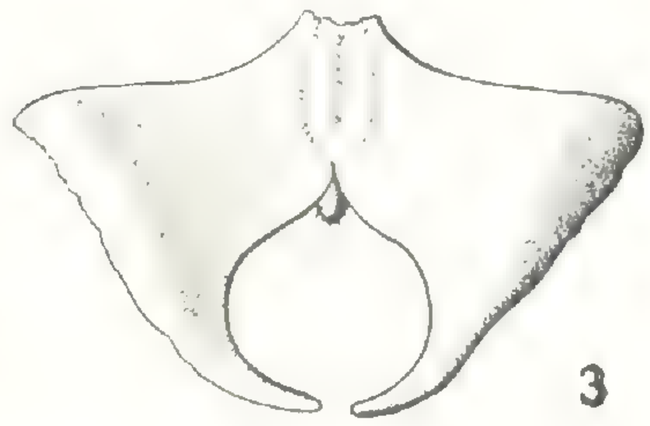


3

1

4

DHM

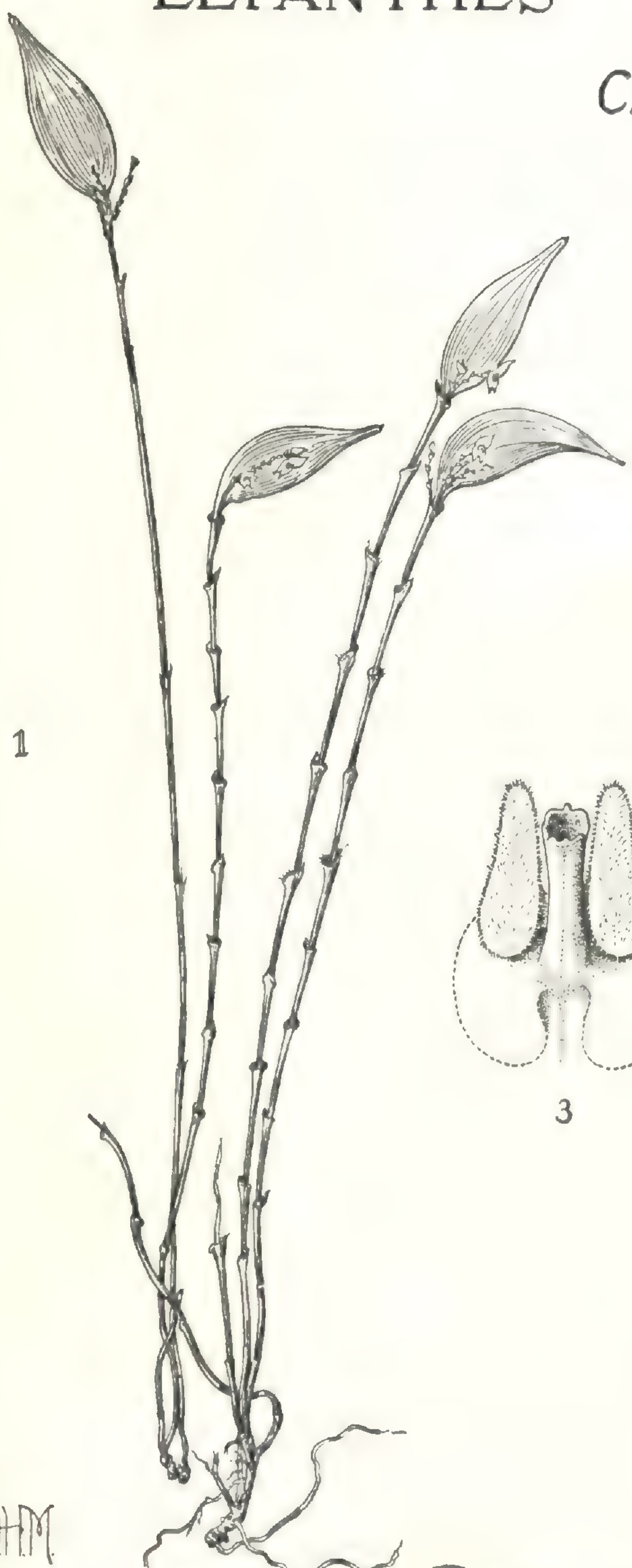
EXPLANATION OF THE ILLUSTRATION

PLATE XXII. LEPANTHES MINUTIPETALA *C. Schweinfurth.* 1, plants, one half natural size. 2, flower expanded, five times natural size. 3, lip and column, showing petals, natural position, eight times natural size. 4, petal, ten times natural size. 5, lip, ten times natural size.

Drawn by DOROTHY H. MARSH

LEPANTHES *minutipetala*

C. Schweinf.



1

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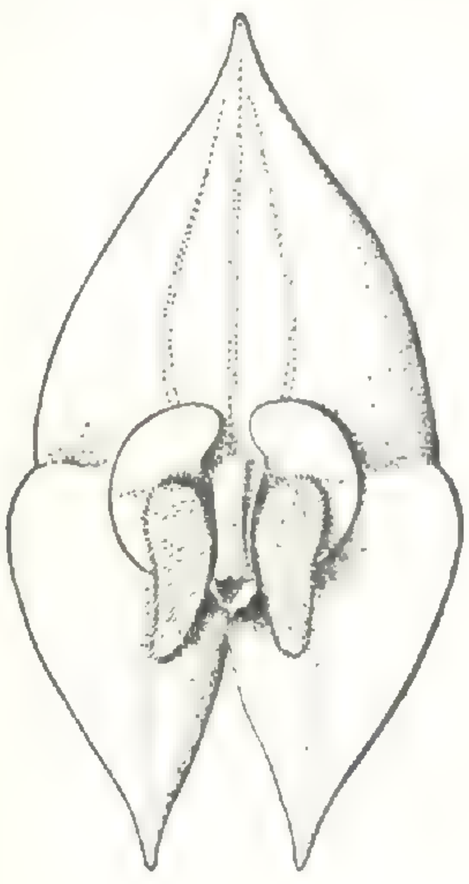
4



2

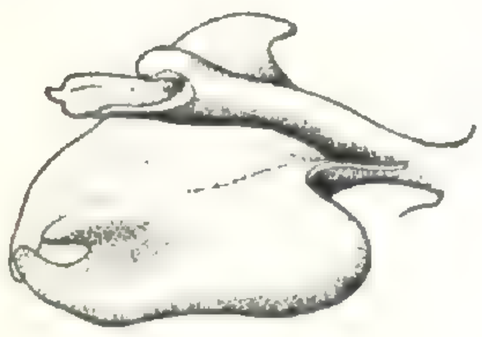
D.H.M.

EXPLANATION OF THE ILLUSTRATION

PLATE XXIII. LEPANTHES PUBICAULIS *C. Schweinfurth*. 1, plant, one and one fourth times natural size. 2, flower expanded, three times natural size. 3, petal, six times natural size. 4, column and lip, three quarters view, twelve and one half times natural size.

Drawn by DOROTHY H. MARSH

LEPANTHES *pubicaulis C. Schweinf.*



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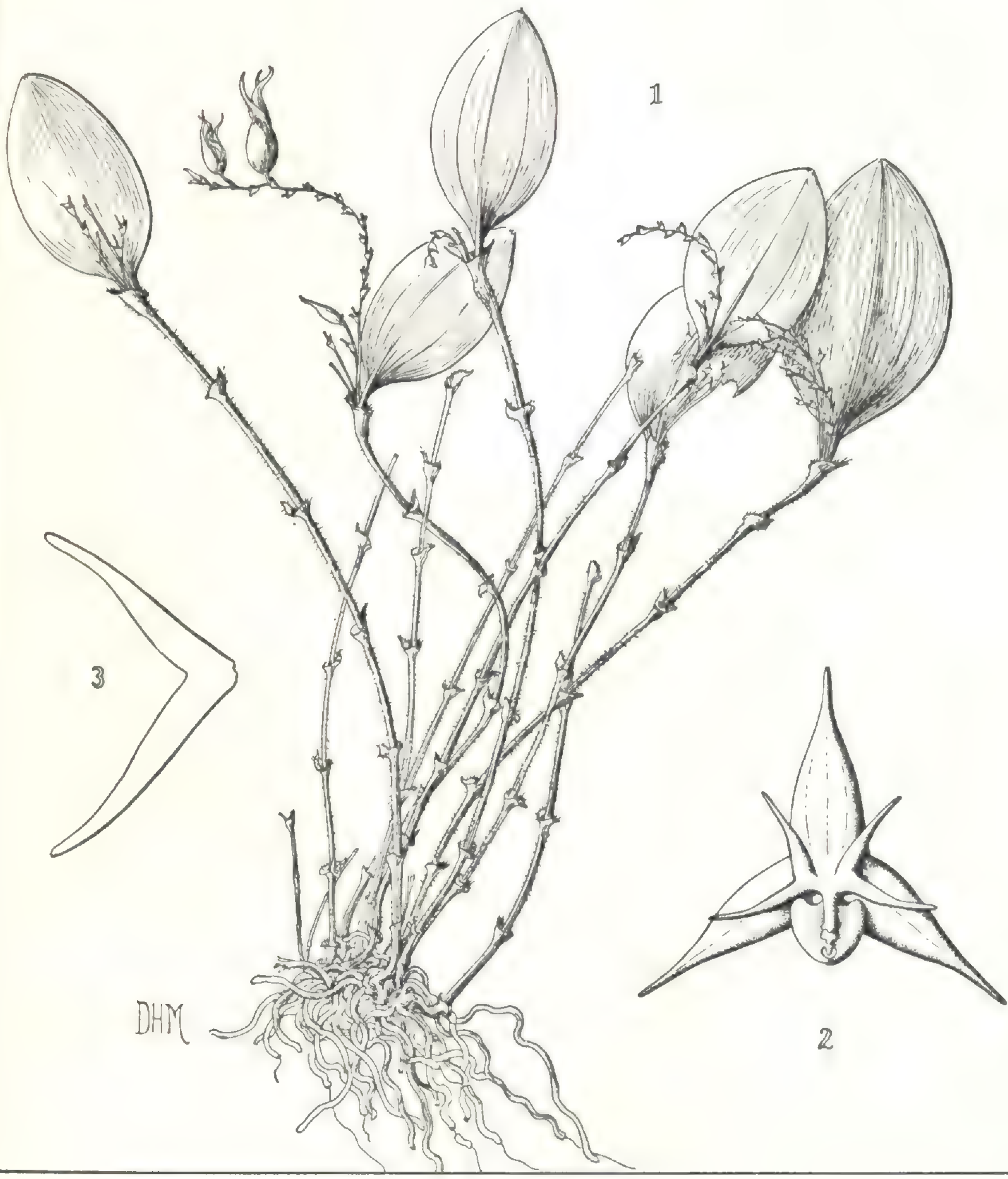


1

3

2

DHM

EXPLANATION OF THE ILLUSTRATION

PLATE XXIV. PLEUROTHALLIS CARINATA *C. Schweinfurth.* 1, plant, two thirds natural size. 2, flower from side, two and one half times natural size. 3, petal, five times natural size. 4, column and lip from side, five times natural size. 5, lip from above, natural position, five times natural size.

Drawn by ELMER W. SMITH

PLEUROTHALLIS

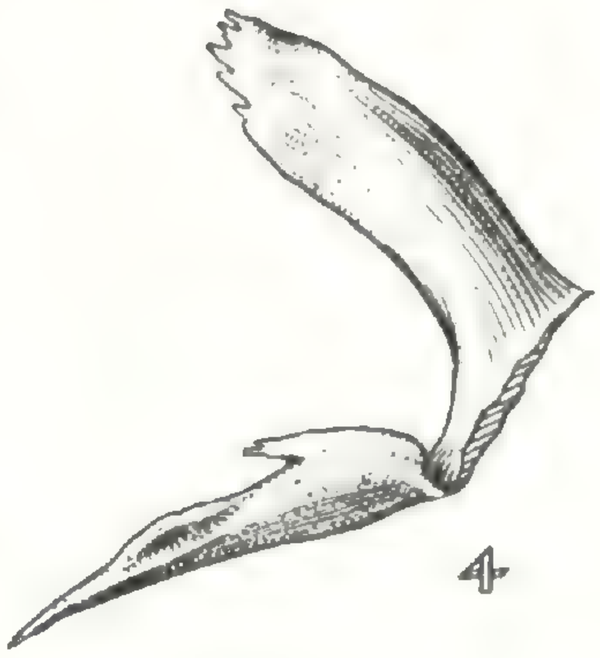
carínata

C. Schweinf.

1

2

3



4

5

EXPLANATION OF THE ILLUSTRATION

PLATE XXV. PLEUROTHALLIS CARNOSIFOLIA *C. Schweinfurth.* 1, plant, one and one quarter times natural size. 2, another leaf with upper part of stem, five eighths natural size. 3, lip, three quarters view, six times natural size. 4, dorsal sepal, four times natural size. 5, petal, four times natural size. 6, column with lateral sepal, four times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS *carnosifolia* C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

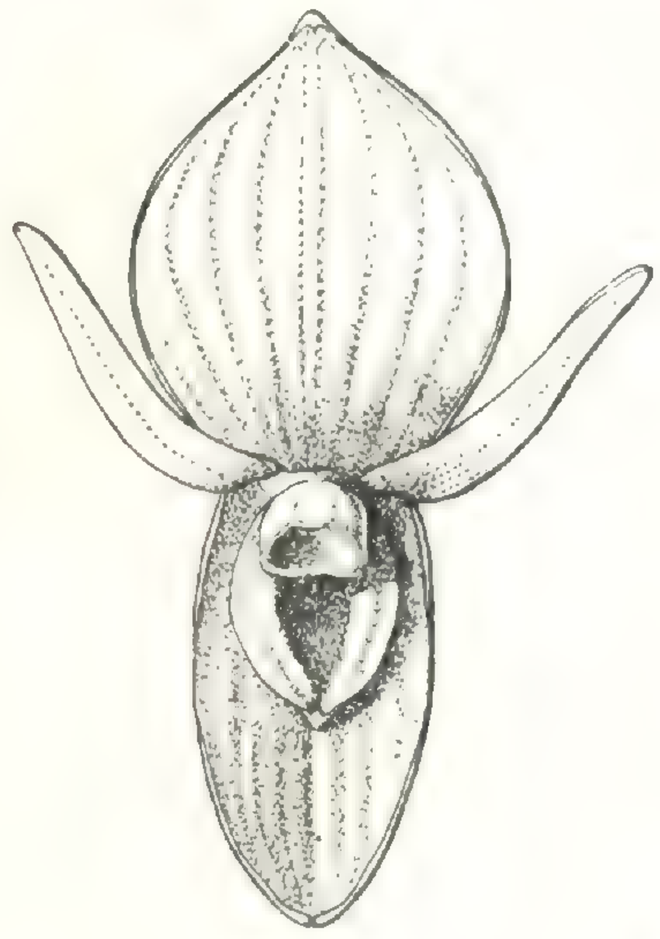
PLATE XXVI. PLEUROTHALLIS CRATERIFORMIS *C. Schweinfurth.* 1, plant, one half natural size. 2, flower expanded, three times natural size. 3, lip three quarters view, five and one fourth times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS

crateriformis

C. Schweinf.



2

3

1

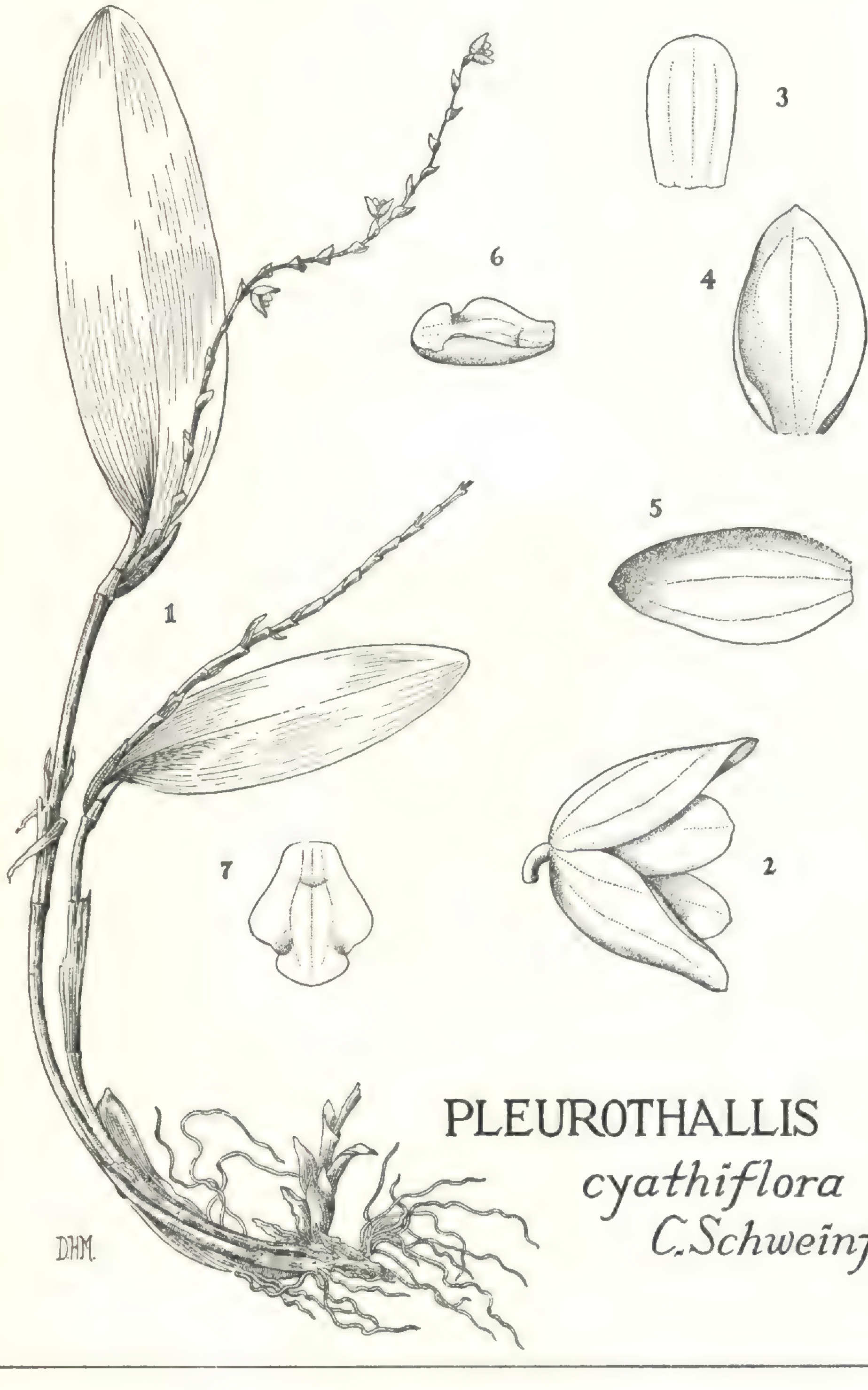
D.M.

EXPLANATION OF THE ILLUSTRATION

PLATE XXVII. PLEUROTHALLIS CYATHIFLORA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower from side, three and three fourths times natural size. 3, petal, three and three fourths times natural size. 4, dorsal sepal partially expanded, three and three fourths times natural size. 5, lateral sepal, three and three fourths times natural size. 6, lip, three quarters view, three and three fourths times natural size. 7, lip expanded, three and three fourths times natural size.

Drawn by DOROTHY H. MARSH

Plate XXVII



PLEUROTHALLIS
cyathiflora
C. Schweinf.

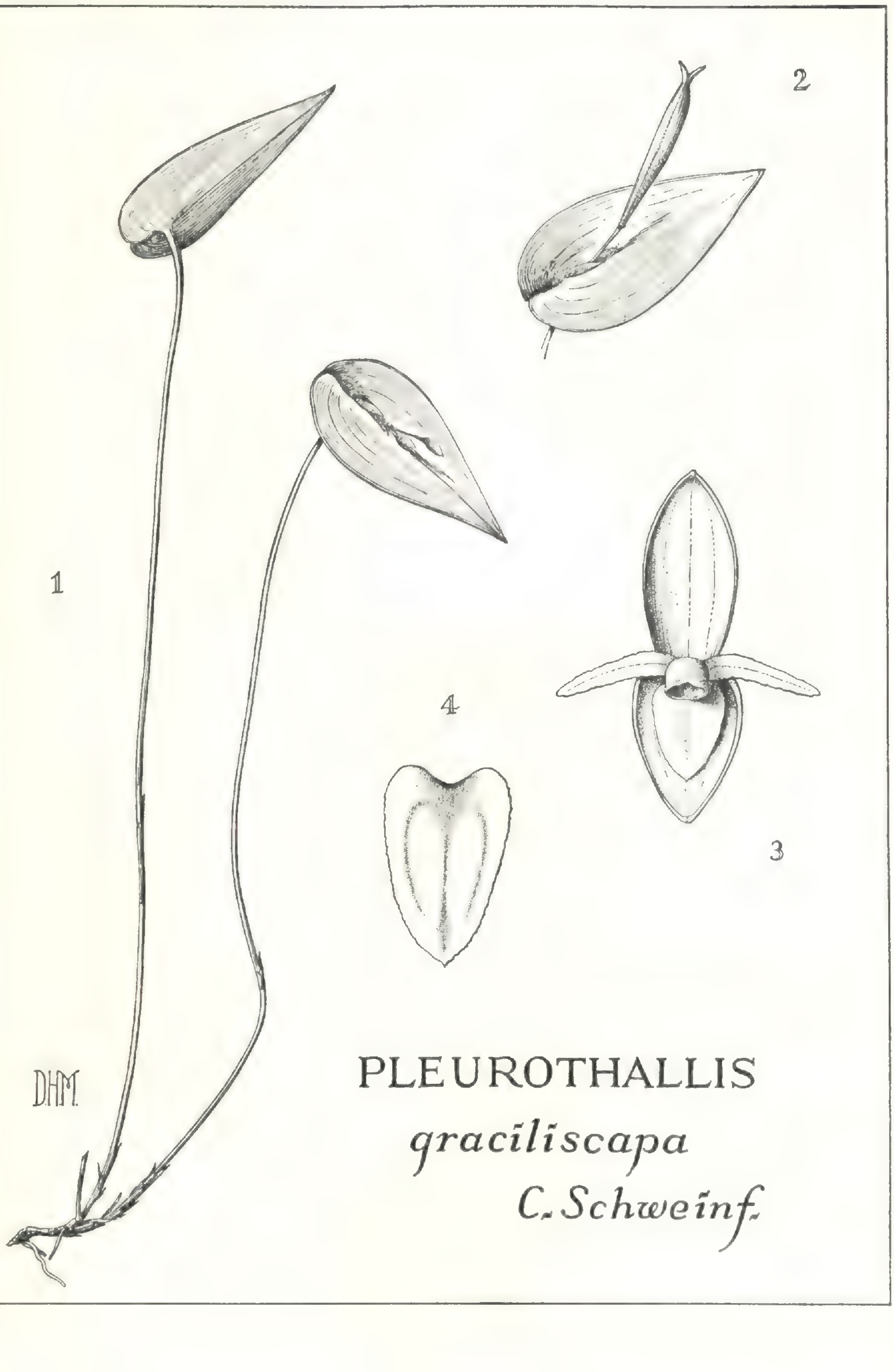
D.H.M.

EXPLANATION OF THE ILLUSTRATION

PLATE XXVIII. PLEUROTHALLIS GRACILISCAPA *C. Schweinfurth*. 1, plant, natural size. 2, leaf with fruit, natural size. 3, flower expanded, six times natural size. 4, lip, ten times natural size.

Drawn by DOROTHY H. MARSH

Plate XXVIII



PLEUROTHALLIS

graciliscapa

C. Schweinf.

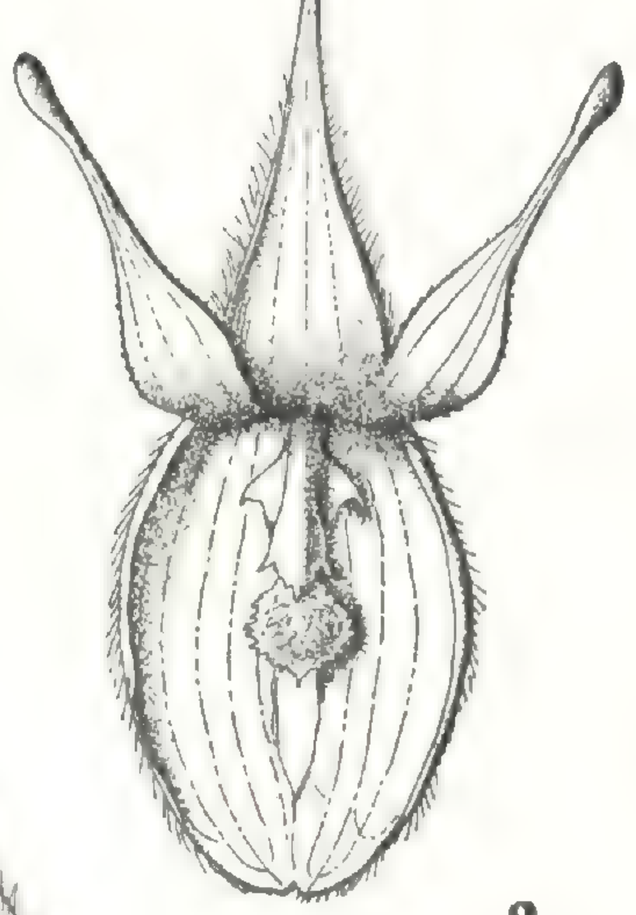
EXPLANATION OF THE ILLUSTRATION

PLATE XXIX. PLEUROTHALLIS HIRSUTISSIMA *C. Schweinfurth.* 1, plant, natural size. 2, flower expanded, three times natural size. 3, lip, seven and one half times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS *hirsutissima*
C. Schweinf.

3



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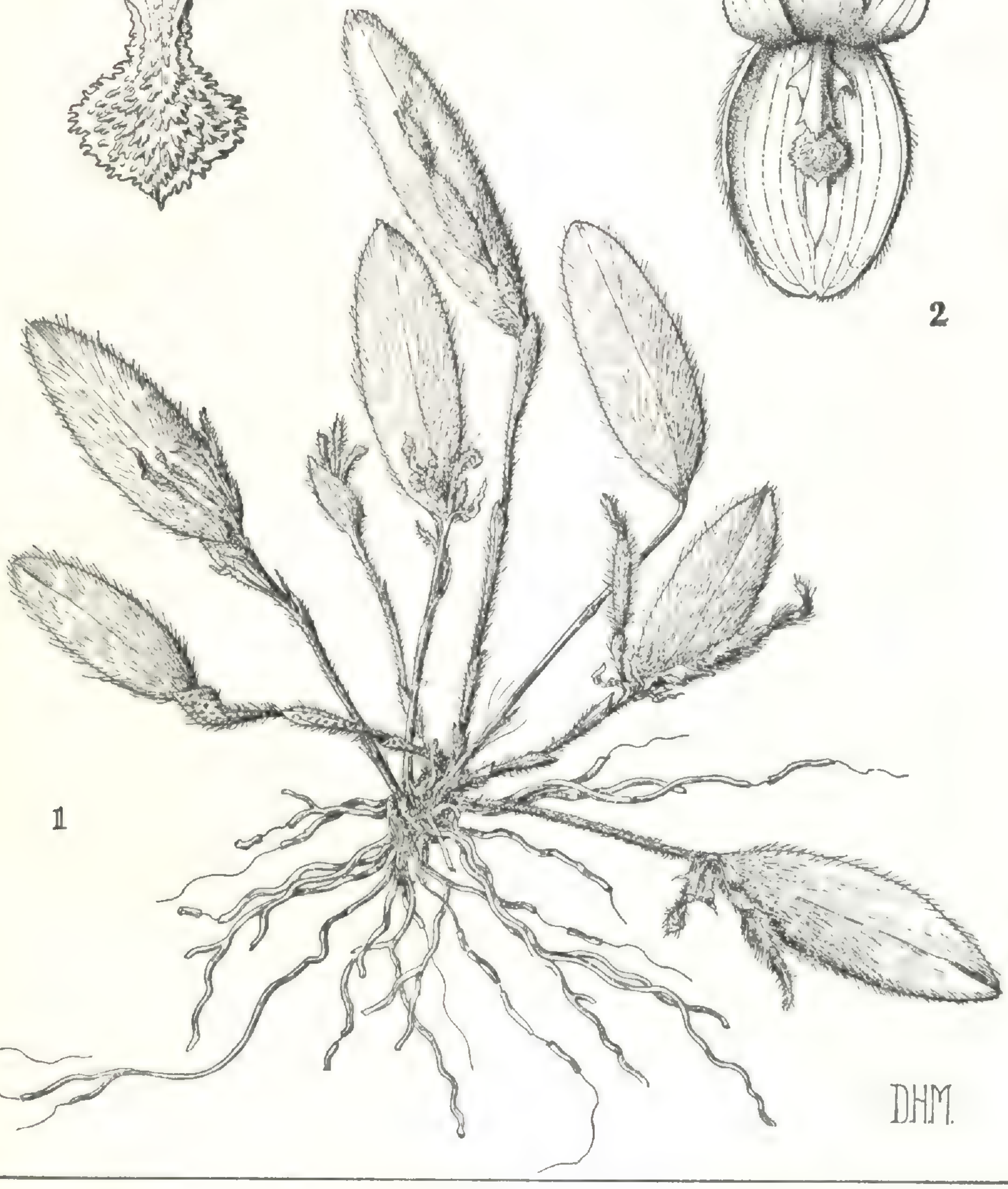


1

DHM.

EXPLANATION OF THE ILLUSTRATION

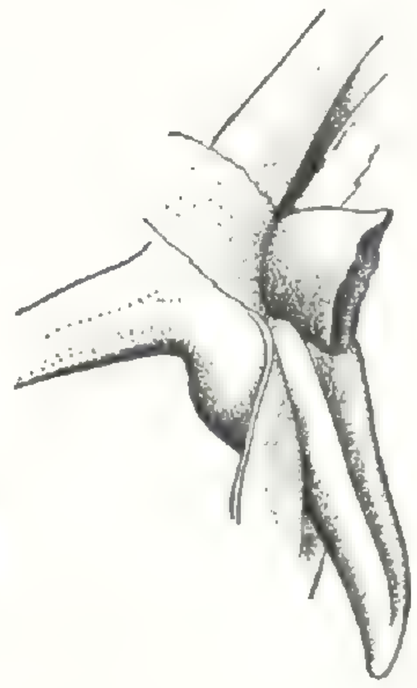
PLATE XXX. PLEUROTHALLIS MAGNIPETALA *C. Schweinfurth*. 1, plant, natural size. 2, flower expanded, five times natural size. 3, column and lip from the side, ten times natural size. 4, lip, ten times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS *magnipetala* C. Schweinf.

4

1



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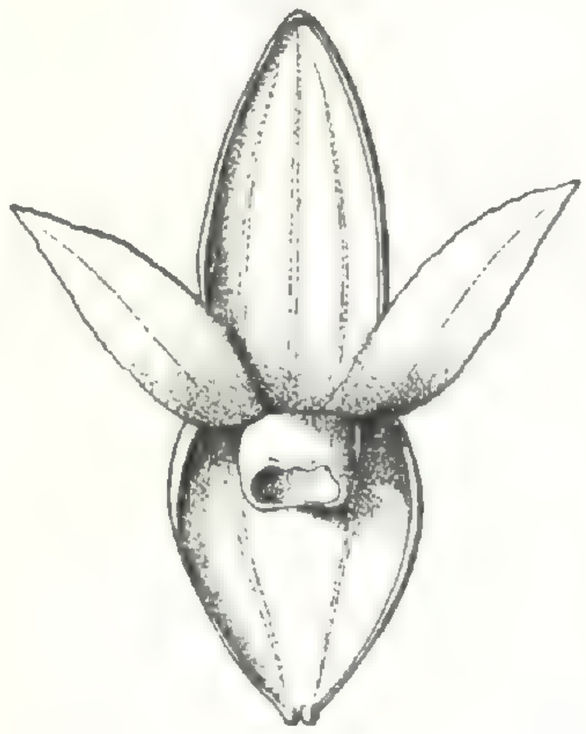


2

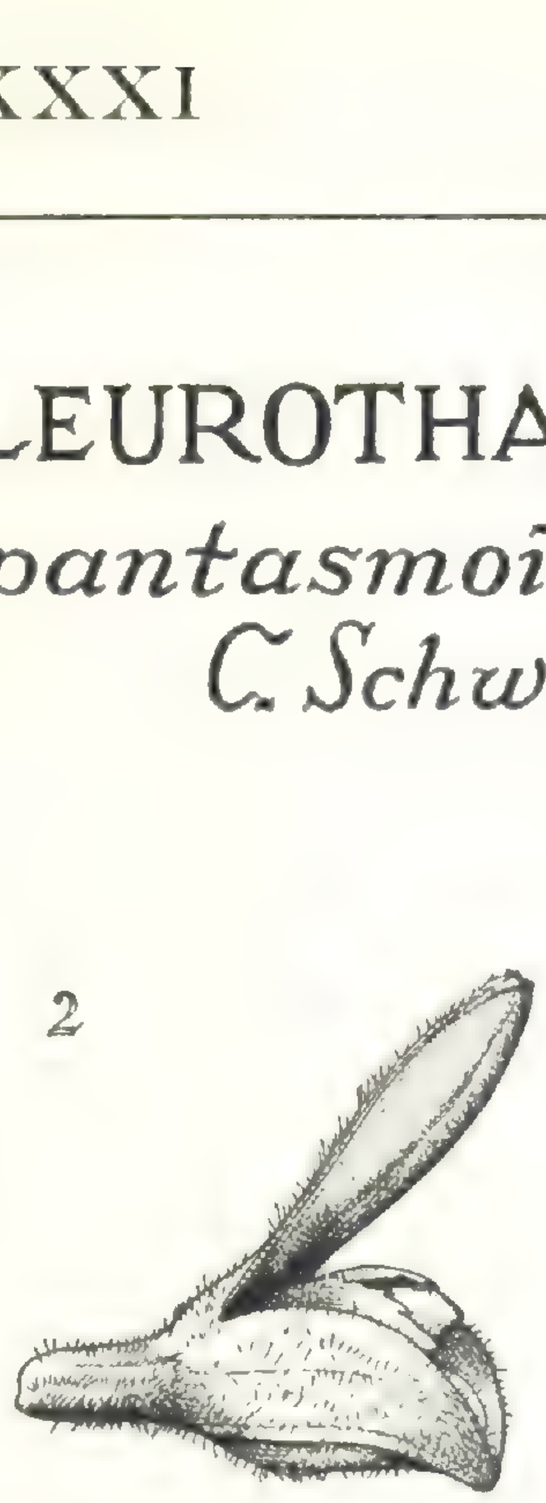
D.H.M.

EXPLANATION OF THE ILLUSTRATION

PLATE XXXI. PLEUROTHALLIS PANTASMOIDES *C. Schweinfurth.* 1, plant, one half natural size. 2, flower from side, three times natural size. 3, flower from front, partially expanded, three times natural size. 4, lip, three quarters view, seven and one half times natural size. 5, petal, seven and one half times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS *pantasmoides* C. Schweinf.



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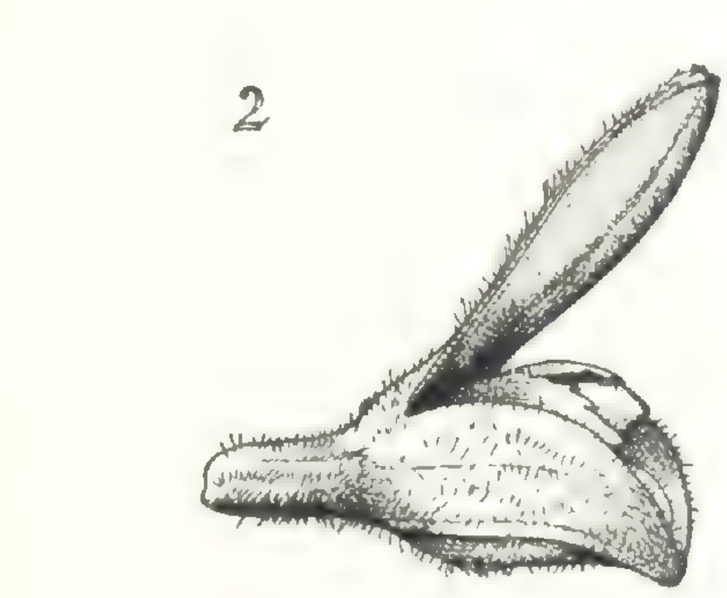

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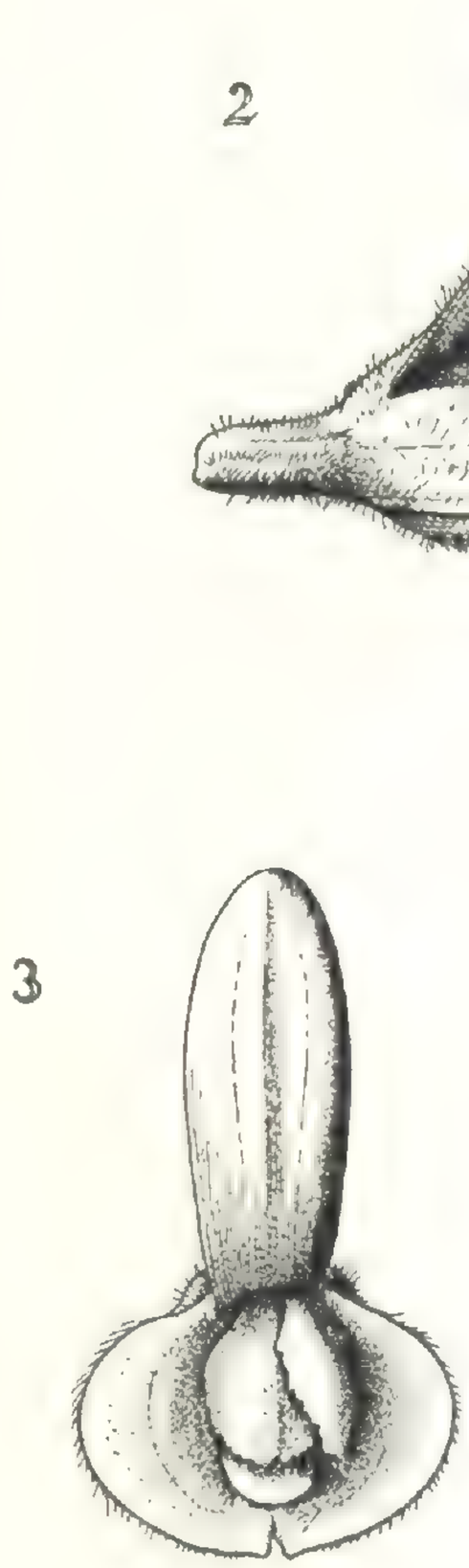
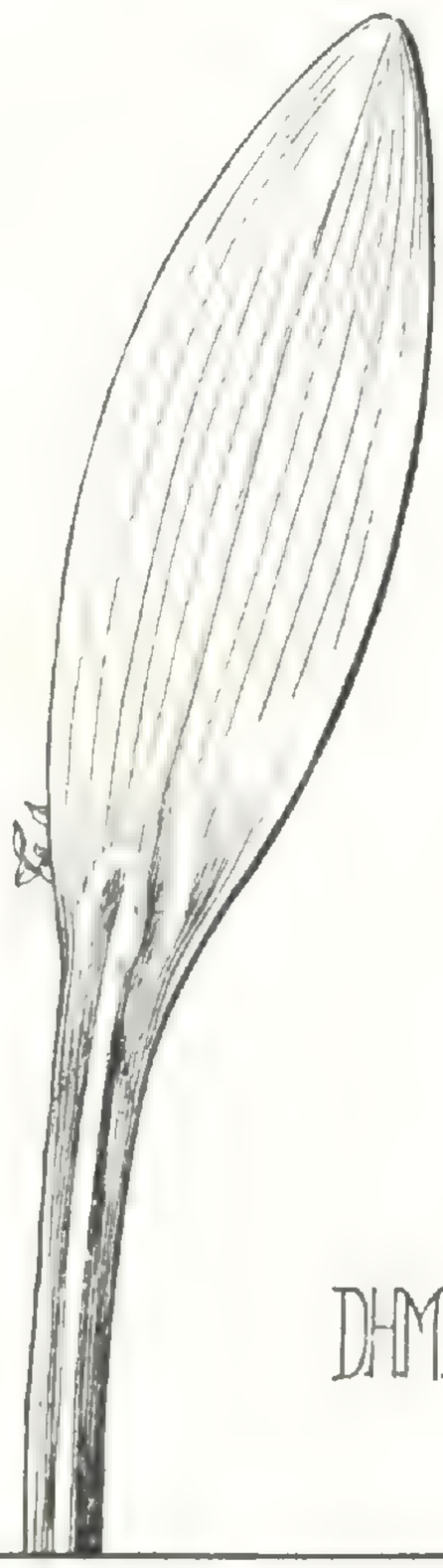


4

5

1



DHM.

EXPLANATION OF THE ILLUSTRATION

PLATE XXXII. PLEUROTHALLIS RETUSILOBA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower from side, natural position, five times natural size. 3, lip expanded, ten times natural size. 4, column and lip, three quarters view, ten times natural size. 5, dorsal sepal expanded, five times natural size. 6, lateral sepals expanded, five times natural size. 7, petal, five times natural size.

Drawn by DOROTHY H. MARSH

PLEUROTHALLIS *retusiloba*

C. Schweinf.

DHM

EXPLANATION OF THE ILLUSTRATION

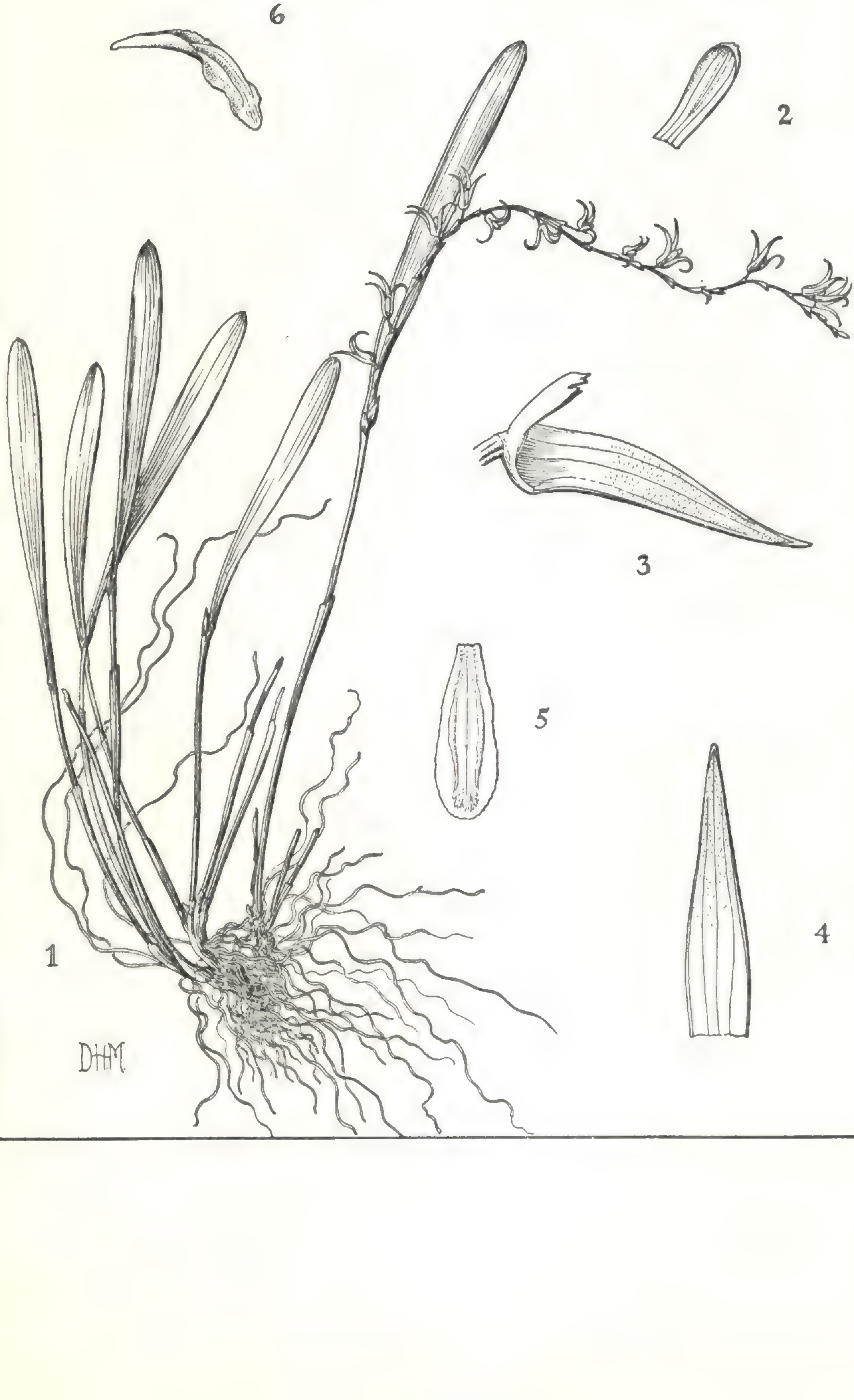
PLATE XXXIII. PLEUROTHALLIS TENUIFOLIA *C. Schweinfurth*. 1, plant, one half natural size. 2, petal from front, three times natural size. 3, lateral sepal and column, three times natural size. 4, dorsal sepal, three times natural size. 5, lip expanded, four times natural size. 6, lip from side, natural position, four times natural size.

Drawn by DOROTHY H. MARSH

PLATE XXXIII

PLEUROTHALLIS *tenuifolia*

C. Schweinf.



EXPLANATION OF THE ILLUSTRATION

PLATE XXXIV. LIPARIS LATICUNEATA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower from side, twice natural size. 3, lateral sepal, twice natural size. 4, petal, twice natural size. 5, dorsal sepal, twice natural size. 6, lip expanded, twice natural size.

Drawn by DOROTHY H. MARSH

LIPARIS
laticuneata
C. Schweinf.

1

2

3

4

5

6

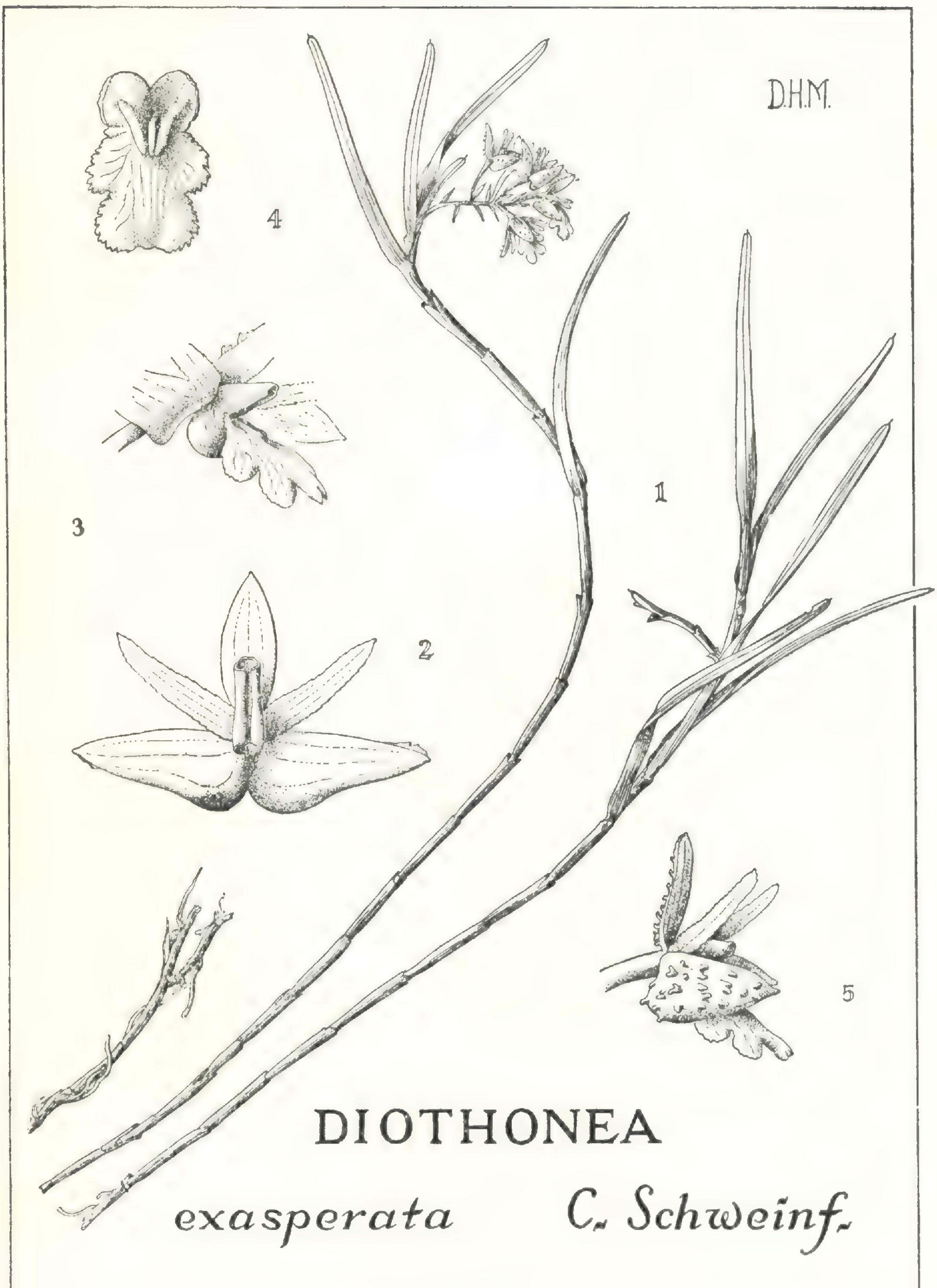
DHM.

EXPLANATION OF THE ILLUSTRATION

PLATE XXXV. DIOTHONEA EXASPERATA *C.Schweinfurth*. 1, plants, one half natural size. 2, flower expanded (without lip), twice natural size. 3, column and lip from side, one and one half times natural size. 4, lip expanded, one and three fourths times natural size. 5, flower from side, one and one half times natural size.

Drawn by DOROTHY H. MARSH

Plate XXXV



DIOTHONEA

exasperata *C. Schweinf.*

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, JANUARY 21, 1952 VOL. 15, NO. 4

STUDIES IN THE GENUS HEVEA IV

BY

RICHARD EVANS SCHULTES[1]

NOTES ON THE RANGE AND VARIABILITY OF HEVEA MICROPHYLLA

LITTLE has been known about the range and variability of *Hevea microphylla*. This was due partly to the scarcity of collections referable to *Hevea microphylla* and partly to an unfortunate confusion of this species with an entirely distinct concept.

THE DISTRIBUTION OF HEVEA MICROPHYLLA

Until recently, the binomial *Hevea microphylla*, published by Ule in 1905 on the basis of material from the middle Rio Negro, has been considered to be synonymous with *H. minor* Hemsley, a name published six years previously for material from the Casiquiare of Venezuela which, upon preliminary field examination, would appear to be identical with the concept described as *H. pauciflora* (Spruce ex Bentham) Muell.-Arg. var. *coriacea* Ducke.

I was fortunate in being able to examine type and other authentic material of *Hevea* at the Royal Botanic

[1]Botanist, Division of Rubber Plant Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture; Research Fellow, Botanical Museum of Harvard University.

Gardens at Kew in 1947. This study led to the discovery that *Hevea microphylla* and *H. minor* are wholly distinct and unrelated concepts (cf. Bot. Mus. Leafl. Harvard Univ. 13 (1947) 1–9). Following my trip to Kew, I spent nearly a year in the Rio Negro basin of Brazil and Colombia investigating, amongst other problems, the differentiation of these two concepts. Material was examined and collected from the type localities, and this was compared with abundant material from other regions. This field research fully corroborated the conclusions drawn from the previous study of herbarium material.

During my stay in the Rio Negro area, it was possible to see many hundreds of trees of *Hevea microphylla* (prior to 1947 known only from the type locality and one nearby station) from the middle Rio Negro to its headwaters and in a number of its affluents. Our knowledge of the range of this most distinctive of all species of *Hevea*, hitherto, to all appearances, a highly restricted endemic, is now much more extensive.

As stated above, until recently *Hevea microphylla* has been confused with *H. minor*. This has contributed to a misunderstanding of its range. Even had this confusion not been so firmly established in the literature, the few available collections of *Hevea microphylla* would have been rather difficult to interpret from a phytogeographical point of view. Furthermore, while sometimes correctly located by earlier writers (e.g., Reintgen, P. "Die Geographie der Kautschukpflanzen" (1905) 23), the concept has often been erroneously attributed in the literature to areas, such as the Acre (de Souza Carneiro, A. J. "Rubber in Brazil" (1913) 8), which are far distant from where it actually does occur.

In 1903, two years before Ule's description of *Hevea microphylla*, H. Jumelle ("Les plantes a caoutchouc et a gutta (1903) 123) published a note on a specimen of

seringueira barriguda with a "conic" fruit. The specimen was collected by M. Bonnechaux on the Rio Caurés, an affluent of the middle Rio Negro below Barcellos. This species, two fruits of which were illustrated (Jumelle loc. cit., fig. 16), is, without any doubt, *Hevea microphylla*. Jumelle reported that it had a very small fruit with "papyraceous" valves "2 millimeters thick" and seeds which are rather long and slightly triangular, measuring 14 mm. across at the base, 11 mm. at the point of attachment, and 25 mm. in length. This is, so far as I have been able to ascertain, the earliest report of *Hevea microphylla*.

The type of *Hevea microphylla*, a fruiting specimen, was collected in 1902 on the Ilha de Xibarú near São Joaquím in the middle Rio Negro, slightly above the town of Barcellos. In 1905 (?), Ducke collected flowering material (the flowers of which were described by Huber as representing *Hevea minor*) near Barcellos. A quarter of a century later, in 1931, Ducke secured flowering material from the type locality. Until recently, these were the only collections of *Hevea microphylla* available. It seemed as though this species, which in a third of a century had been collected only a few times and in one very small area, represented one of the most highly restricted endemics of the genus.

In May 1937, Mr. Charles H. T. Townsend, Jr., then director of the Ford plantations on the Rio Tapajóz, introduced *Hevea microphylla* into cultivation from the Rio Negro. There are, at the present time, four selections of this species growing at the Belterra plantations. *FM 1516* and *FM 1517* were collected on an island in front of the settlement of Cumarú, below Barcellos. This locality is the southernmost station known for the species. *FM 1518* and *FM 1519* are selections from trees found along a creek back of Barcellos. All were prop-

agated from budwood. When I saw *Hevea microphylla* at Belterra in September 1948, it appeared to me to show rather slow growth as compared with *H. Benthamiana* and *H. Spruceana* which had been introduced from the same general area and which occur naturally in sites which are ecologically similar to those occupied by *H. microphylla*. At Belterra, of course, the material was budded on root-stocks, presumably of *Hevea brasiliensis*, growing on a high, well-drained plateau.

The recent trips of Senhor Ricardo de Lemos Fróes to the Rio Negro have extended our knowledge of the range of *Hevea microphylla*. Several of his collections, cited below, are referable to this concept. *Fróes 812*, collected in 1942, is stated to have been found in the "middle Rio Negro, 600 miles . . . from Manáos" and *Fróes 812B* in the Rio Enuixí, in the Municipality of São Gabriel, much farther upstream, near Tapurucuara. In 1947 and 1948, Fróes secured material from the Rio Padauarí and the Rio Caurés, interesting affluents of the middle course of the Rio Negro.

In 1944, Dr. John T. Baldwin, Jr., who carried out cytogeographic studies of *Hevea* in the Amazon Valley, visited the Rio Negro. In an article on his interpretation of the genus *Hevea* (in Journ. Hered. 38 (1947) 54), he reported: "*H. minor* was found on the Rio Uaupés as a bottle-butted tree, at the Venezuelan border, as a treelet to 10 feet, and along the Rio Negro in estradas with *H. Benthamiana* and of stature comparable to that of representatives of *H. Benthamiana*." Specimens of Baldwin's collections have been unavailable to me for study, but in conversation Baldwin has assured me that the tree to which he was referring in this statement represents the concept now known correctly as *Hevea microphylla*.

In October 1947, in company with Ing. Agron. João

Murça Pires of the Instituto Agronomico do Norte of Belém, I had an opportunity of visiting the type locality of *Hevea microphylla* — the Ilha de Xibarú — and of studying a number of trees, from some of which collections were made.

Later, during my stay in the Rio Negro basin, I encountered many hundreds of trees of *Hevea microphylla* at Piloto, near Barcellos, and along the Rio Negro, from a point slightly above the confluence of the Negro and the Uaupés to the mouth of the Içana, with an extraordinary concentration in the vicinity of the town of São Felipe, slightly below the mouth of the Içana. This species was also found to be present in surprising densities along the lower course of the Rio Içana and the Rio Xié. A botanically fascinating trip into the country of the Rio Dimití, an affluent of the left bank of the upper Rio Negro which penetrates completely unknown territory, brought to light *Hevea microphylla* in this river. Farther upstream in the Rio Negro, *Hevea microphylla* was found to be rather abundant along the inundated banks of the lowermost course of the Río Guainía, in both Colombian and Venezuelan territory. It was also collected in the Rio Curicuriarí, although it is not at all common there. Along the low flood-banks of the Igarapé da Chuva at Taracuá on the Rio Uaupés and along the lower portion of the Rio Tiquié, an affluent entering the Uaupés below Taracuá, *Hevea microphylla* forms one of the characteristic elements of the flora. In several other localities, especially on the islands in the Rio Uaupés and the middle Rio Negro, reports of the inhabitants indicated the presence of *Hevea microphylla*. Their accurate description of the fruit of this species, so different from that of all other Heveas, and the widely known common name of *seringueira tambaquí*, leave no doubt in my mind that these reports are reliable.

We may, then, on the basis of the collections and these reports (which, in many cases, are from points intermediate between the localities from which collections have been made), state that *Hevea microphylla* is endemic to the Rio Negro basin, ranging continuously, when ecological conditions will permit, from slightly below Barcellos up the Rio Negro to the confluence of the Casiquiare and the Río Guainía nearly to Maroa; possibly into the Casiquiare; in the lower reaches of most of the affluents of the middle and upper portions of the Rio Negro, such as the Içana, Xié, Dimití, Curicuriarí, Padaurí, Enuixí and Caurés; up the Rio Uaupés, especially on the islands, to Ipanoré (the first major rapids going upstream), possibly not beyond this point; and in the lowermost reaches of the affluents of the Uaupés. Formerly believed to be confined to Brazil, *Hevea microphylla* has now been found in both Colombian and Venezuelan territory.

Descriptions of Hevea microphylla

Hevea microphylla *Ule* in Engler Bot. Jahrb. 35 (1905) 669, tab. 1: fig. j, k, l, m; Ule in Kautschukgewinnung (Kolonialwirtsch. Kom. 1905) (1905) 10; Huber in Bol. Mus. Goeldi 4 (1906) 634 [non accurate, sub *Hevea minore*], 636; Pax in Engler Pflanzenr. 4, 147 (1910) 125; Ducke in Arch. Inst. Biol. Veget. 2, no. 2 (1935) 241, pro parte, tab. p. 246, a–f, 247, a–b [non accurate, sub *Hevea minore*]; Ducke in Bol. Téc. Inst. Agron. Norte, no. 10 (1946) 20, pro parte; Schultes in Bot. Mus. Leafl. Harvard Univ. 13 (1947) 1–9; Seibert in Ann. Mo. Bot. Gard. 34 (1947) 276, 285, 292, pl. 39; pl. 40, fig. 8; pl. 41, fig. 8; pl. 42, fig. 8; pl. 43, fig. 2.

Hevea microphylla Ule var. *typica* Pax in Engler Pflanzenr. 4, 147 (1910) 126.

Hevea microphylla Ule var. *major* Pax in Engler Pflanzenr. 4, 147 (1910) 126.

ORIGINAL DESCRIPTION:

". . . . foliis rigide membranaceis, pro proportione parvis, foliolis ovalibus, acuminatis, acutis, glaberrimis, sub basi petiolulorum glandulis distinctis munitis: floribus ignotis; capsulis triangulatis, trigonis subalatis, suturis parietalibus elevatis, acutis, striatis, laevibus, seminibus ovoideis, obsolete quadrangularibus, maculatis.

"Baum von ca. 8–18 m. Höhe mit feinerer Verzweigung; Blätter 8–14 cm. lang; Teilblätter 5–8 mm. gestielt, mit 2 schwärzlichen erhabenen Drüsen an der Ansatzstelle versehen, 60–70 mm. lang, 24–34 mm. breit, nach beiden. Enden verschmälert, dunkelgrün, unterseits etwas heller, deutlich geardert, etwas zugespitzt, spitz; Kapsel 40–50 mm. lang, 30–40 mm. dick, dreiekig und dreiseitig mit hervortretenden, fast geflügelten Kanten und mit erhabener Wandnaht, spitz, nach den dunke grün Kanten zu weissgrün gestreift; Samen von aschgraver Farbüng, dunkelbraun, unregelmässig gefleckt, von undeutlich vierseitiger, eiformiger Grundgestalt, 20–25 mm. lang und 12–15 mm. dick."

The earliest description of the flowers of *Hevea microphylla* is that of Huber (loc. cit.) who, however, referred it to *H. minor*.

"*Paniculae* e basi innovationum numerosae breves (petiolis foliorum inferiorum breviores) subsimplices, flore [femineo] singulo terminatae, caeterum flores masculinos in ramulis brevibus gerentes, glabrae. *Flores* masculini breviter pedicellati lutei extus albido-tomentelli vel subsericei, clausi ovoideo-lanceolati (4 mm. longi, 2 mm. crassi) longe acuminati (loborum apicibus contortis), aperti 5–6 mm. longi, 6–7 mm. diametro metientes, perianthо ad 2/3 longitudinis in lacinias ovato-lanceolatas

longe acutissimeque acuminatas diviso, *disco e glandulis 5 ovatis acuminatisque composito, columna staminali elongata glabra apice breviter trifida*, antheris 10 bi-verticillatis, verticillis demum distantibus antherisque irregulariter insertis. *Flores feminei* masculinis paulo maiores basim versus glabri, disco e squamis bilobis cum staminodiis alternantibus composito, *ovario subglabro in stylum brevem attenuato.*"

Study of the material now available has enabled me to prepare the following extended description:

Arbor parva vel mediocris, usque ad sexaginta pedes (sed saepissime minor) alta. Truncus basi valdissime incrassatus, plerumque 16–18 poll. in diametro, sursum abrupte in truncum columnarem et gracilem fastigans, latice albo aquosoque. Cortex plusminusve 7 mm. crassus, comparate mollis, ab cambio facile desquamans, extrinsecus laevis, spadici-brunneo, intus albo-straminellus. Rami graciles, hornotino incremento cortice laevissimo nitido et conspicue rufo obtecto, ramulis foliiferis cum annulo angusto cicatricibus foliorum squamellarum formato alternantibus. Petioli graciles, 2-6 cm. (plerumque 3–4 cm.) longi, circiter 1 mm. in diametro, teretes, cortice glabro et basin versus rubicundulo-brunneo, tenuiter striati, basi leviter dilatati, apice valde biglandulosi, glandulis nigrescentibus, turgidis, reniformibus confluentibus. Petioluli graciliores, 6–10 mm. (plerumque 9 mm.) longi. Foliola valde reclinata rarius horizontalia (vel horizontali-reclinata), vivo discoloria statu adulto tenuiter papyracea vel demum firme membranacea (numquam vivo subcoriacea), elliptica vel lanceolato-elliptica, basi rotundata vel satis abrupte attenuata, apice acuminata, emarginata, 5–16 cm. (plerumque 7–10 cm.) longa, 2–5 cm. (plerumque 2.5–3.5 cm.) lata, supra vivo atroviridia, subnitida, omnino glaberrima, infra pallidiora, glabra sed oculo armato magnopere minutissime albido-scobi-

culata; costis subtus elevatis, subtus conspicuis sed non elevatis, glabris, secundariis duodecim ad quindecim. Stipulae mox deciduae, subulatae, graciliores. Paniculae abbreviatae, quam folia multo breviores, aliquid rigidae, mediocriter floribundae, glabrae. Alabastra staminata longe conico-acuminata, 4–5.5 mm. longa, calycis segmentis apicem versus leviter contortis; pistillata paulo majora, subcylindrico-acuminatissima, 6.5–8.5 mm. longa, calycis segmentis apicem versus leviter contortis; utroque sexu segmentis apice ipso pubescentibus et non callosis. Flores breviter pedicellati, lutei, fragrantissimi (ut dicitur). Calyces crassiusculo-membranacei; staminati 4–7.5 mm. (plerumque 7 mm.) longi, vulgo per 3/5 longitudinis partem partiti, extus et intus tomentelli; pistillati plerumque 7.5–8 mm. longi, vulgo per 1/2 vel 3/5 longitudinis partem partiti, extus dense albido- vel aureo-tomentelli sed saepe basim versus subglabrescentes, intus aliquid densius tomentelli, utroque sexu laciniis angustissime lanceolatis apicem versus subulatis et acutissimis, margine integris (sed florum pistillatorum leviter incrassatis), luteis, florum staminatorum laciniarum apicibus non se aperientibus pistillatorum parum aperientibus. Antherae vulgo decem, irregulariter biverticillatae, magnae, atrobrunneae ut videtur, 0.5 mm. longae; columna suprastaminalis non gracilis, glabra, apice ipso obtusiusculo, usque ad 10 mm. (sed saepissime minus) ultra antheras producta. Disci glandulae florum staminatorum carnosulae, rotundato-triangulares, erecto-patulae, glabrae, basi connatae; florum pistillatorum membranaceae, aliquid inaequales, acuto-triangulares, usque ad 0.6 mm. longae, valde erectae, glabrae. Ovarium glabrum sed minute punctatum, globosum vel subglobosum, 2–2.2 mm. in diametro; stigmata magna, congesta, carnoso-capitata, glabra, 1 mm. in diametro. Torus floris pistillati carnosus, maxime incrassatus, quam calycis tubus multo latior,

usque ad 4.5 mm. in diametro, nigrescens. Capsula comparate parva, pyramidalis, in circuitu triangularis, apice vulgo acutissima, maturitate plusminusve 40 mm. longa sed saepe paulo longior, 30 mm. in diametro, suturis parietalibus elevatis et carpello quoque carina dorsali, longe pedunculata, laevis, atroviridis sed in suturis et carinis prominenter flava, apicem versus rufescens; paulatim dehiscens, semina simpliciter per casum non per fragorem diffusa; coccorum valvae tenues, coriaceae, post dehiscentiam valdissime contortae, in pedunculo diu persistentes, epicarpio tenuissimo, vivo perfecto levi, 0.6 mm. crasso, endocarpio 1 mm. crasso. Semina elongato-ovoidea, proclivitate longitudinaliter triangulari-ovoidea, in circuitu tetragona et valde angulosa, 20–27 mm. × 12–15 mm. × 11–13 mm. (plerumque 26 mm. × 14 mm. × 11 mm.), pallide cinereo-brunnea cum maculis irregularibus parvis spadicibus, raphide non prominenti et faciebus magnis, valde prominentibus.

COLLECTIONS EXAMINED:

BRAZIL: Estado do Amazonas, Rio Negro basin. "Insula Xiparú, São Joaquim [Nom. vulg. =] *seringa serapó.*" February 1902, *E. Ule 6023.*—Same locality and date. [Nom. vulg. =] "*barriguda.*" *E. Ule 6024* (*Hevea microphylla* var. *majoris* typus).—Same locality and date. [Nom. vulg. =] "*tambaquí seringa.*" *E. Ule 6025* (Typus).—Barcellos. 1905 (?) *A. Ducke 7027.*—Insula Xiparú, prope São Joaquim ". . . . silva profunde inundata. Arbores (3 ex.) parvae vel mediocres, trunco infra incrassato, flor pallide luteis. *Seringa barriguda* vel *seringa tambaquí.*" August 8, 1931, *A. Ducke, Herb. Jard. Bot. Rio 23750* (Topotypus).—Rio Enuixí, Lake Dondona (Municipality of São Gabriel). "Igapó. Latex white, rubbery, abundant." Tree 40 ft., [diameter] 15 inches." 1942 (?) *Ricardo de Lemos Fróes sine num.*—"Middle Rio Negro, 600 miles east [sic] of Manáos." 1942, *Ricardo de Lemos Fróes 812.*—Rio Enuixí, Lake Januari (Municipality of São Gabriel). March 22, 1942, *Ricardo de Lemos Fróes 812B.*—Rio Enuixí, Lake Dondona (Municipality of São Gabriel), May 18, 1947, *Ricardo de Lemos Fróes 22371.*—Estado do Pará, Rio Tapajóz, Belterra. "Cultivated. Original from middle Rio Negro near Barcellos." June 26, 1947, *George A. Black 47-951.*—Rio Negro, Xibarú, near São Joaquim.

"Small tree, swollen at base, but rapidly tapering upwards, slender and graceful at top. Bark smooth, red brown outside. Capsule coriaceous." October 7, 1947, *Richard Evans Schultes & João Murça Pires 8884* (Topotypus).—Same locality and date. *Schultes & Pires 8887* (Topotypus); *8888* (Topotypus).—Estado do Amazonas, Rio Negro basin, Rio Padauarí, Tapíra. November 2, 1947, *Ricardo de Lemos Fróes 22706*.—Rio Padauarí, Tipica, November 19, 1947, *Ricardo de Lemos Fróes 22888*.—Rio Negro, São Felipe (below mouth of Rio Içana). "Tree 60 feet tall, columnar, diameter 1 foot. Bark smooth but pustulate, red-brown, thin, peeling easily, hard, inside white. Bark of terminal branches red. Latex white, very watery, not coagulating, extremely sparse. Leaflets horizontal, dark green, shiny above, paler, slightly glossy beneath. Wood soft. "*Seringueira tambaquí.*" January 8, 1948, *Richard Evans Schultes & Francisco López 9591*.—Same locality and date. *Schultes & López 9593; 9607; 9608; 9609; 9610; 9612; 9612A*.—Río Curicuriarí, near mouth of river. January 22, 1948, *Schultes & López 9644*.—Río Uaupés, Taracuá, Igarapé da Chuva. "Very small tree, 20 feet tall; basally swollen, with slender, graceful whip-like trunk above swelling. Leaflets horizontal-reclinate. Latex thin, watery, white." February 3–6, 1948, *Schultes & López 9690*.—Same locality and date. *Schultes & López 9691; 9692*.—Rio Negro, Piloto (between Barcellos and São Joaquím). "Small tree. Latex yellowish, very thin. Leaflets reclinate." March 23, 1948, *Schultes & López 9735*.—Rio Negro, São Felipe (below mouth of Rio Xié). "Whip-shaped tree, 65 feet tall; basally swollen; diameter 16–17 inches, rapidly tapering to a slender trunk. Bark $\frac{1}{2}$ cm. thick, hard, outside reddish brown, smooth (with lenticels), inside reddish. Latex very sparse, thin, white. Bark of terminal branchlets smooth red. Leaflets glossy, dark green above; dull, lighter green beneath, horizontal. *Seringueira tambaquí.*" April 4, 1948, *Schultes & López 9755*.—Same locality and date. *Schultes & López 9756; 9757; 9758; 9759; 9760; 9761*.—Rio Negro, Igarapé Imutá, opposite mouth of Rio Içana. Tree 60 feet tall, basally swollen, tapering upwards in whip fashion. Bark thin, smooth, hard, externally red-brown, internally tan. Latex thin, white. Leaflets horizontal-reclinate." April 4, 1948, *Schultes & López 9762*.—Same locality and date. *Schultes & López 9763; 9764*.—Rio Negro, São Felipe, downstream from Igarapé Taurí, below the town. "Slender tree 45 feet tall with slightly swollen base. Bark outside smooth, dark tan-red; inside soft, light tan. Leaflets reclinate-horizontal. Latex thin, white. Crown small." April 5, 1948, *Schultes & López 9766*.—Same locality and date. *Schultes & López 9767*.—Rio Negro between São Felipe and confluence with Rio Uaupés. "Swamp tree 45–50 feet tall, at base swollen to diameter of 12 inches but rapidly tapering upwards. Leaflets strongly reclinate.

Latex white, very sparse, watery. Bark outside smooth, light reddish tan, inside tan to whitish; ½ cm. thick, hard, brittle. Fruit ripening yellow." April 5, 1948, *Schultes & López 9773.*—Rio Negro, at mouth of Rio Içana. "Bellied tree, 14 inches in basal diameter, rapidly tapering up; 60 feet tall. Crown small. Leaflets reclinate. Fruit yellow, with three green stripes, pointed. Bark smooth, reddish tan, thin, hard. Latex very watery, white. Bark of terminal branchlets red." April 6, 1948, *Schultes & López 9780.*—Rio Içana, near mouth. "Slender tree 40 feet tall, swollen at base, in deeply flooded area. Leaflets reclinate. Latex white, thin. Crown small." April 7, 1948, *Schultes & López 9783.*—Same locality. April 11, 1948, *Schultes & López 9812.*—Rio Negro, Igarapé Carapaná (near confluence with Rio Uaupés). "Tree 60 feet tall, basally swollen, diameter 14 inches. Standing in water. Leaflets reclinate. Latex white, watery. Crown small. Bark rather scaly, outside reddish brown, inside whitish, hard, brittle, ½ cm. thick or more. Bark of branch tips red." May 3, 1948, *Schultes & López 9866.*—Rio Dimití, near mouth of the river. In deeply flooded igapó. "Tree 35 feet tall; basally greatly swollen and very abruptly tapering upwards to form a whip-shaped trunk. Crown very small. Latex white, watery, sparse. Bark thin, hard, brittle, externally tan, internally whitish. Leaflets very strongly reclinate." May 12–19, 1948, *Schultes & López 9924.*—Rio Dimití, near confluence with Rio Yauiyabú. In igapó at edge of caatinga. "Small tree 35–40 feet tall. Basally swollen, abruptly tapering upwards to a graceful, slender stem. Crown sparse. Latex thin, white. Bark externally dark tan, internally whitish. Leaflets reclinate." May 12–19, 1948, *Schultes & López 9990.*—Rio Caurés, Igarapé Miritĺ. June 8, 1948, *Ricardo de Lemos Fróes 23337.*—Rio Tikié, near mouth. "Small tree, 35 feet tall in standing water. Basally swollen, tapering to a graceful, slender trunk. Crown sparse. Latex white, thin. Leaflets reclinate." June 24, 1948, *Schultes & López 10167.*—Rio Padauirí, Tapéra. June 30, 1948, *Ricardo de Lemos Fróes 23299.*

COLOMBIA: Río Guainía, near confluence with Casiquiare. "Small tree with sparse crown. Leaflets reclinate. Latex thin, white." June 1948, *Schultes & López 10035.*—Comisaría del Vaupés, Río Guainía, lower course of river, near Cerro Monachi (Cerro Heebee). "Tree 60 feet tall; basally swollen, diameter 17 inches. Leaflets reclinate. Bark rather scaly, thin, outside reddish tan, inside whitish, ½ cm. thick. Bark of terminal flushed red. Latex watery, white. *Seringa de mono.*" *Schultes & López 10041B.*

VENEZUELA: Territorio del Amazonas, Río Guainía, half way between Maroa and confluence with Casiquiare. "Small tree with swollen base. Height 45 feet. Leaflets reclinate. Latex white, thin. Bark dark tan. Crown very small." June 1948, *Schultes & López 10166A.*

The variability of Hevea microphylla

From an evolutionary point of view, *Hevea microphylla* is one of the most fascinating species of the genus. It is morphologically very distinct from all other species in the form and dehiscence mechanism of its fruit. As has been pointed out (Schultes loc. cit.), the capsule of *Hevea microphylla*, the valves of which never become woody but remain thin and coriaceous, opens slowly, not explosively, drops the seed directly beneath the tree, and remains attached for some time to the peduncle. Furthermore, this species is the only one in which the fruit normally ripens yellow. The epicarp, which is exceptionally thin and at first a deep, dark green, gradually lightens, becomes yellower, until the completely mature fruit is often a canary-yellow, with six green stripes along the three parietal sutures and the three dorsal keels of the carpels. The basal portion of the very ripe capsule has a definite cherry-red hue near the peduncle and this color, often spreading rather widely, approaches the sides of the capsule. One collection (*Schultes & López 9812*) had fruits which were reddening at the base, near the peduncle. It would seem that this red color is correlated with some chemical alteration which takes place the last few days before complete ripening (i.e., during the final "drying out" of the fruit structure which leads to dehiscence). I believe this because the red appears at the tip rather suddenly and spreads speedily just before dehiscence. This rapidity is more noticeable in *Hevea microphylla* than in any other species with the curious red hue. This bright red color is also particularly noticeable in the ripened capsules of *Hevea nitida;* whereas in *H. pauciflora* and *H. rigidifolia*, a very definite dull purplish-red is characteristic. In all other species of the genus, the mature capsule is normally green,

usually a dark, glossy green. The ripened capsule of *Hevea microphylla* is truly a thing of beauty.

The shape of the fruit is characteristic. It is definitely triangular in cross section and pyramidal in longitudinal section, coming to a point. Even when fully ripe, it does not swell to a rounded condition, but the dorsal surfaces of the carpel wall retain their more or less flattened shape with prominently swollen dendritic veins. It is this curious trigonous and pointed shape which, in suggesting the shape of the head of the fish called *sarapó*, is responsible for one of the common names of the plant—*seringueira sarapó* (Ducke in Bol. Téen. Inst. Agron. Norte 10 (1946) 21).

The shape and size of the seeds are unusually constant. The seed is characteristic in being more or less triangular-ovate in outline, grayish brown with large, irregular, dark chocolate-brown spots.

Nor is the fruit the only structure of *Hevea microphylla* which exhibits an outstanding peculiarity. The pistillate flowers—the largest of the genus—are provided with an extraordinarily enlarged torus which persists, even in the young fruit, as a fleshy collar.

The bark of *Hevea microphylla* is consistently thin—averaging about one-half a centimeter at about three feet from the base—and hard, often even brittle. Externally, it is usually smooth and of a tan-brown or reddish tan color; internally, there seems to be some variation, for a few of the trees examined were whitish or yellowish, others were tan, and a few were definitely reddish.

There are two remarkable and constant bark characters, however, which demand a note. One is the very thin, glossy and bright red bark of the young branches or flushes of the past year. This character has been seen elsewhere, so far as my own field experience is concerned, only in *Hevea nitida*. The other character is the ease

with which the bark will peel when small pieces are cut from the cambium. The only other species of *Hevea* which I have found to peel so easily is *H. Spruceana*.

The latex of *Hevea microphylla* is, in all of the individuals examined, extremely sparse and very watery. It is almost always white, but occasionally it will darken to an ivory color if it stands for several hours. Only one tree (*Schultes & López 9735*) with definitely yellow latex was encountered. Coagulation of the latex is always accomplished with extreme difficulty. A specimen procured by slow coagulation and drying in the air (without the use of acids) remained very sticky for a long period of time and was completely devoid of elasticity. Needless to say, *Hevea microphylla* is never tapped. It is important to note this information, since an early and widely quoted source (Corrêa, Pio M., "Flora do Brasil (1909) 115) included *Hevea microphylla* (together with *H. minor* and *H. rigidifolia*) in the enumeration of the species yielding rubber commercially. Carl D. La Rue ("The Hevea rubber tree in the Amazon Valley," U.S.D.A. Bull. 1422 (1926) 8), recognizing that *Hevea microphylla* and *H. minor* represent two distinct concepts, relegated *H. microphylla* to those "species yielding poor rubber, rarely collected."

The trunk of *Hevea microphylla* is very characteristic. The trees grow in rather dense colonies along the very margin of creeks and smaller rivers and on the rim of sand islands in the larger rivers. These areas are subject to extreme flooding. The usual height of the water during the rainy season, as indicated by waterlines on the bark, is ten to twelve feet, but I have encountered areas (near São Felipe, for example) where the tree was standing in eighteen feet (measured) of water. Inundation persists from five to six months, and even during the rather pronounced dry season, the ground rarely becomes

firm, retaining a boggy character. Probably in response to this bog or igapó habitat, *Hevea microphylla* develops a very swollen base. The basal portion of the trunk is not actually "bellied" (in spite of the use of the name *seringueira barriguda*—"bellied rubber tree"—in some localities) but is merely swollen. Above the level of the high water, the trunk abruptly tapers to a very slender and gracefully bent columnar shape (see the schematic drawing in the lower left corner of the map). The crown is unusually sparse, but the few branches are sufficiently heavy to cause a bend in the upper part of the slender trunk and, as a result, the whip-shaped habit. In this character, *Hevea microphylla* resembles certain types of the igapó-dwelling *H. Benthamiana*. Although the latter is a much stouter and more heavily-crowned tree than the former, it also has a very swollen, almost bellied, basal portion of the trunk which rapidly tapers upwards. It is almost always possible to ascend with climbing irons to the crown of *Hevea Benthamiana*, which is called *seringueira chicote* or "whip rubber tree" in some localities, but the trunk of *Hevea microphylla* is usually too slender and too flexible to support the weight of a man. Collection of the foliage and fruit was therefore made by felling the tree with an axe from the prow of a canoe during the season of deepest inundation.

In *Hevea microphylla*, we find a slight variation in the position of the leaflets and a very appreciable variation in their shape and size. Notes were taken on the many trees which were examined. The great majority have definitely reclinate leaflets, while a few have them completely horizontal to reclinate. Studies have shown that the position of the leaflets of an individual tree, once they have reached maturity, does not change with age, or with seasonal or environmental effects. At the type locality, all of the trees which I examined had very

strongly reclinate leaflets. At São Felipe, on the upper Rio Negro, where several hundred trees were seen, there would seem to be a tendency for the leaflets to be horizontal-reclinate, with some approaching a definitely horizontal disposition. Whether or not there are definite regional tendencies, it is not possible to say, but I should be inclined to doubt that large samples of populations of this tree in given localities would show any appreciable deviation from a mean in this character. In its predominantly reclinate leaflet position, which frequently deviates to horizontal or horizontal-reclinate, ***Hevea microphylla*** again suggests ***H. Benthamiana.***

In 1910, Pax described a variety of Ule's ***Hevea microphylla***—var. *major*—on the basis of variation in leaf size. In 1947, after an examination of the several Ule collections at Kew, I wrote: (Schultes, loc. cit. 4) "There are no valid reasons whatsoever for Pax's creation of ***Hevea microphylla*** var. *major*. Pax gives as his basis for the variety 'foliola majora, angustiora,' but *Ule 6023* and *6025* as well as *Ducke 7027* and *Ducke HJBR 23750* show all possible intergradation in the size of the leaflets, and this is known to be a character of little taxonomic value in ***Hevea.***" After having seen hundreds of trees in the forests and making herbarium collections of representative individuals, I can state that ***Hevea microphylla*** is unusually variable in regard to the size and even the shape of the leaflets. The very great majority of the trees live up to the specific epithet, having relatively small leaflets which are elliptic or, more usually, lanceolate-elliptic, apically very long-acuminate, and measuring 7–10 cm. long and 2.5–3.5 cm. wide. Some trees (as may be seen in ***Schultes & López*** *9691*, however, have very broadly elliptic-ovate leaflets with very short or even abruptly acuminate tips and measuring up to 9.5–12 cm. long and 4.7 cm. wide. These are extreme

variations, even for such a variable genus as *Hevea*. That Pax, who had never had an opportunity of studying this rubber tree in the field, created var. *major* should not be too strongly decried, for without a large series of specimens or some field work, such variation really would seem to be significant.

There is occasionally some variation in the texture of the leaflets. Sometimes one finds a deviation from the stiffly papyraceous texture and an approach to what we may term almost subcoriaceousness. This, I have ascertained in the field, is due neither to the age of the leaflets, nor to seasonal changes in the tree, nor to ecological factors. It might possibly be interpreted as an indication of hybridization, but after extensive association with *Hevea microphylla* in the field, I believe that, in general, there has been comparatively little hybridization of *Hevea microphylla* with other species.

Hevea microphylla customarily has subconcolorous leaves, although often they dry markedly discolorous, a phenomenon which prompted my statement, in separating the concept known as *Hevea minor* from *H. microphylla* (Schultes, loc. cit. 8) that *H. microphylla* is characterized by "folia discolora." There are, however, deviations from this subconcolorous condition. *Schultes & López 9691*, pointed out above as being atypical as to size and shape of leaflets, is also noteworthy in being rather subcoriaceous with the two surfaces, in life, differing markedly in color; the upper a dark, glossy green; the lower, a very pale, dull green. It might be argued that this tree had genic influence from *Hevea pauciflora* var. *coriacea*, but since other characters appear to be normal and the habitat was a more or less open swamp with no shade, this texture might as logically be the result of adaptation for extreme xerophytism and radiation.

In the length of the petiole, there is hardly any vari-

ation worthy of note, the very large leaves having a petiole of about the same size as the smaller, mature leaves.

Sufficient flowering material is not yet available for an appraisal of the variation in floral characters. The constancy in characters of the fruiting structures would tend to suggest little, if any, in the floral structures.

Affinities of Hevea microphylla

It would, perhaps, be premature to suggest with any definiteness the closest affinities of *Hevea microphylla*. There can be no doubt, however, but that this is the most outstandingly distinct species of the genus and is really closely allied to no other species.

In the unusually large flowers and in the apical twisting of the calyx lobes, *Hevea microphylla* somewhat resembles *H. rigidifolia*. In the lacerations of the pistillate disk, it bears some resemblance to *Hevea pauciflora* and to *H. nitida*. In the number and placement of the anthers, *Hevea microphylla* is similar to *H. brasiliensis*. The brilliant red, papery bark on the new flushes of *Hevea microphylla* finds a parallel in *H. nitida;* whereas the bark of the basal portions of the trunk, in color and in the ease with which it peels from the cambium, are suggestive of *H. Spruceana*.

In having leafy shoots or flushes which alternate with narrow rings of bud-scale scars (interflush rings), *Hevea microphylla* is grouped, in Seibert's key (Seibert, loc. cit. 291–292) with *Hevea Benthamiana* and *H. brasiliensis*. I am inclined to view this recently discovered character which Seibert has called "interflush short-shoots" as having possibly a deep significance in an evolutionary study of the group, but certainly the other characters which *Hevea microphylla* has in common with *H. Benthamiana* and *H. brasiliensis* are few and often superficial.

There is no other known species of *Hevea* which combines so many exclusive and apparently anomalous characters as *Hevea microphylla*. The unique leathery capsule and its slow and gentle dehiscence (contrasting so markedly with the woody capsule and its sudden and explosive dehiscence in all other species) has been discussed in detail by Ducke (in Arch. Inst. Biol. Veg. 2, no. 2 (1935) 235, 243) and by Schultes (loc. cit. 7). The peculiarity of this mechanism alone is enough to set *Hevea microphylla* entirely apart from all other species. The enormously swollen torus on the pistillate flower is likewise unique, for no other species of *Hevea* has an analogous structure. The green-yellow-red coloration of the capsule is unknown elsewhere in the genus. Furthermore, the shape of the seed is completely unlike that of any other species, and the curious coloration is peculiar to *Hevea microphylla*.

Huber (in Bol. Mus. Goeldi 4 (1906) 622) included *Hevea microphylla* in his series *Intermediae*, together with *H. brasiliensis* and *H. minor*, thus intimating that these three were more nearly allied to each other than to other species. Later, he suggested (in Bot. Mus. Goeldi 7 (1913) 202) that further studies might indicate the desirability of removing *Hevea microphylla* and *H. minor* from series *Intermediae* to form, with *H. rigidifolia*, a new series.

There are so many differentiating characters of the first magnitude to be found exclusively in *Hevea microphylla* that we are forced to regard the concept as standing entirely alone with no closely constituted allies in the genus. It is indeed rather puzzling. Florally, as a glance at the tabular summary of characters shows, *Hevea microphylla* has more characters in common with *H. nitida*, *H. pauciflora* and *H. rigidifolia*, which are probably the "oldest" concepts in the genus, than with any other

Summary of characters of *Hevea microphylla*

Hevea microphylla	H. Benthamiana	H. brasiliensis	H. guianensis	H. nitida	H. pauciflora	H. rigidifolia	H. Spruceana
Ecological site periodically flooded	x	x[1]					x
Tree, small to medium	x			x	x[3]	x	
Trunk basally swollen	x	x[1]					x
Trunk tapers abruptly to slender column, usually flexibly bent	x[2]						
Crown sparse				x	x[3]	x	
Bark of young flushes bright red				x			
Leafy shoots alternating with narrow rings of bud scale scars	x	x					
Leaflets usually reclinate, sometimes horizontal-reclinate	x	x		x		x	x
Pistillate flowers large				x		x	x
Pistillate flowers with swollen torus							
Pistillate disk conspicuous, lacerated				x	x	x	
Staminate flowers large						x	x
Staminate buds acute or acuminate, not truncate or obtuse	x	x				x	
Ovary glabrous or nearly so				x	x	x	
Staminate disk conspicuous	x			x	x	x	
Anthers 10, irregularly or subregularly biverticillate		x		x	x		
Valves of capsule coriaceous							
Dehiscence slow, not explosive							
Fruit ripens yellow							
Tip of fruit, when ripe, with red hue				x	x	x	
Capsule conic-pyramidal, pointed							
Seeds triangular-ovate in longitudinal section							

[1]) Some variants of *H. brasiliensis* are not basally swollen, and those growing above flood-level are rarely, if ever, swollen.

[2]) Not all variants of *H. Benthamiana* are of this structure.

[3]) Some variants of *H. pauciflora* are large trees with dense and heavy crowns.

species. I am unable, however, to see *Hevea microphylla* as one of the older concepts. On the contrary, the curious marginal distribution of *Hevea microphylla* could be interpreted to indicate that the species is a relatively new one, although what we believe to be the older concepts of *Hevea* are found abundantly represented in the same area. Ecologically, it occupies localities similar to those chosen by *Hevea Benthamiana* and *H. Spruceana*, neither of which has seemed to me to represent the most ancient species of Hevea. If it arose recently, we could wonder and well ask: "What were its prototypes?" To find an answer by studying the comparative morphology of the plant may not, at the present state of our knowledge, be an easy task, nor a productive one.

It is possible that further exploration will yield an as yet unknown species of *Hevea* which will provide some phylogenetic linkage between *Hevea microphylla* and some of the better known species. Until some such clew is available and, lacking experimental evidence of a genetic nature, the immediate affinities of *Hevea microphylla* must remain a thought-provoking mystery.

Ecological relations of Hevea microphylla

Usually one finds *Hevea microphylla* growing on the sandy rims of islands or along creeks near the main river and, therefore, subject to deep and long inundation. In both habitats, the soil is light, almost always of a sandy or lateritic nature, and highly acidic. The small bar-like islands have a low vegetation which allows the individuals of *Hevea microphylla*, small though they be, to grow in numerous, rather congested colonies and often to protrude well above the competing vegetation. Usually in the island sites, no other species of *Hevea* occupies the margin where *Hevea microphylla* is found. If the island be large enough, then *Hevea Benthamiana* can almost

always be found a small distance in from the shore. There is a band, then, where the two species are somewhat contiguous. *Hevea Spruceana* is often found along the edges and in the interior of these islands where the soil is less sandy and where a muddier condition indicates more organic residue. *H. Spruceana*, *H. microphylla* and *H. Benthamiana* are frequently seen in a contiguous distribution, but I have never found these three or *Hevea microphylla* occurring with any of the other species in a mixed stand.

This island type of habitat is found, for the most part, from the mouth of the Rio Curicuriarí downstream, probably merely because the islands above this point are smaller and almost always rock bound with little, if any, floodable area. There are, however, some small islands in the Rio Uaupés where the *seringueira tambaquí* is reported.

In the middle Rio Negro the same type of distribution found on the islands often obtains where the banks of the mainland are low and comprise flood land. At Xibarú and Piloto, for example, a visit to the banks along the river in the vicinity of the islands which are rimmed with *Hevea microphylla* showed that in certain sandy stretches along the shore itself and near the mouth of sandy creeks —wherever deep muddy silt was not abundant—this species was common. At Xibarú, I estimated a density of about four or five trees per hektar at the mouth of a creek on the right bank directly opposite the Ilha de Xibarú.

In the upper Rio Negro, we can find *Hevea microphylla* along the main bank of the river itself, and inland along low and sluggish creeks to a rather appreciable distance. The main affluents of the Rio Negro also have stands of *Hevea microphylla* at appropriate sites along their banks and near the mouth of creeks. The greatest

single concentration of this species I found at São Felipe. Immediately in back of this tiny town there are several meandering brooks which, in the rainy season, become creeks. The land about three quarters of a mile behind the town rises gently, and one finds *Hevea guianensis* var. *lutea* and *H. pauciflora*. Brooks rise on these elevations, but when they reach the low flat land lying immediately behind the town and stretching above and below along the river, they broaden and meander and, in the wet season, are lost in the general inundation which lasts from four to six months. It is in this low-lying land that one finds *Hevea microphylla*. In the vicinity of São Felipe, in the areas where it is found, it occurs to the exclusion of *Hevea Benthamiana*, and in densities which I estimated, along the creeks, at an average of about 7 to 10 per hektar. From São Felipe up to the mouth of the Rio Içana, *Hevea microphylla* is found in high concentration. *Hevea Benthamiana* grows near São Felipe, but on slightly higher banks which, unlike the meandering creek beds, protrude appreciably (up to twelve feet or more) during the dry season and become quite firm and dry. The land on which *Hevea microphylla* occurs at São Felipe, as elsewhere, is almost always boggy even though it is rather sandy. That *Hevea microphylla* sometimes occurs in estradas with *H. Benthamiana* is not ecologically significant, for an estrada is a twisting and direction-less, so to speak, path made by a tapper to reach his trees. *Hevea microphylla* is never tapped, but a tapper may pass any number of trees of this species to reach stands of *H. Benthamiana*. The estrada, in other words, may cut across the lower lying areas inhabited by *H. microphylla*.

In my field book, I wrote the following passing observations while going up the Rio Içana in April 1948: "In the Içana, *Hevea microphylla* is by far the common-

est species along the deeply flooded banks with low vegetation from the mouth up to San José. It is unusually abundant in some places. In one locality (*9783*) there were forty-two trees in one hektar! At another, farther upstream near Tapurú, twenty-six. At some points, it grows in a very slender band exactly at the water's edge; but, where the bank immediately rises to form high land, it stops and is replaced by *Hevea guianensis* var. *lutea* and *H. pauciflora*, the latter more frequently near sand than the former. At one place, *Hevea microphylla* was growing in great abundance, and twenty-five feet away from several large trees there were a number of individuals of *H. guianensis* var. *lutea*. The former were all in ripening fruit, the latter not yet in flower. There was not the slightest indication in any of these individuals that crossing had happened. *Hevea Benthamiana* has not been seen along the Içana so far, and it would not surprise me to find it absent from this river. It may be significant that the many Indians here, although producing chicle and sorva, never have produced rubber."

An incidental note entered during my work near São Felipe describes the separation of *Hevea microphylla* and *H. Benthamiana:* "Around São Felipe, '*seringueira barriguda*' or '*seringueira torada*' (*Hevea microphylla*) is extraordinarily common and abundant. The right bank of the river from well above the mouth of the Içana—as well as the lower 50 kilometers of the Içana itself—is populated with *Hevea microphylla* to the exclusion of all other species in the floodlands. On the opposite bank, this species is found in the creeks, but *Hevea guianensis* var. *lutea* controls the highest banks, whilst *H. Benthamiana* takes over the floodbanks. *Hevea microphylla* and *H. Benthamiana* are seen together below São Felipe, but only the former species occurs in the extensive 'lakes' which open out below São Felipe—and there

only on the edge of the drier land, not out in the permanent igapó vegetation (chiefly *Ambelania* sp.) of the lake itself. *Hevea microphylla* has a number of invariable companions in this region (São Felipe), and these actually serve as indicators. A *Clusia* with enormous leaves, *Leopoldinia pulchra* (the yará palm), a beautiful species of *Ouratea*, *Henriquiezia verticillata*, a medium-sized *Bombax* with a large red flower, sometimes *Mauritiella aculeata*, and, most striking of all, *Moronobea pulchra* are found occupying the same association. A species of *Manilkara*—exploited for chicle—also accompanies these plants."

Opposite Umadona on the Rio Negro, slightly below the mouth of the Rio Dimití, the interesting Igarapé Badaití meanders into the hinterland through dense swamp and lake areas. My notes concerning this area state: "Along the banks of the Rio Negro in this region, *Hevea Benthamiana* is common. Going up the igarapé (creek), one finds several caatingas: we visited two—one caatinga-forest and one low, sandy, open caatinga. In the former, we found *Cunuria crassipes* excessively abundant—just finishing flowering and some with large, reddening fruits. . . . Continuing up the igarapé, one sees a little *Hevea Benthamiana* wherever there is *slightly* flooded ground. Farther up, *Hevea microphylla*, unfortunately now all over flowering and fruiting, begins to appear. At first it is tall—as at São Felipe—up to 55 feet in height, but with the typical sparse crown. Where inundation is still deeper—up farther in the igarapé—the tree becomes a much smaller individual, very like those at Xibarú, the type locality."

The botanically unknown Rio Dimití is unusually interesting, principally because it rises in the fascinating and mysterious mountains of the Cauaburí. Excerpts from my notes (May 14, 1948) of a rapid trip along this

river indicate the occurrence there of *Hevea microphylla*: "The lower part of the Dimití is mostly very deeply flooded igapó with the low vegetation characteristic of such areas . . . . About 20 kilometers from the mouth upstream, *Hevea microphylla* appeared. It becomes more and more abundant as we go upstream. It is a low tree of perhaps some 35 feet with at least 10 feet of this now under water in some places . . . . Further upstream, the river is reduced to a mere channel of about five feet in width winding very tortuously through deeply flooded igapó with an occasional knob of highland."

One of the most unusual habitats for *Hevea microphylla* is the low, almost treeless open "caatinga" in the lower part of the Igarapé da Chuva which empties into the Rio Uaupés at Taracuá. Here, *Hevea microphylla* occurs, standing alone with an occasional and stunted *Bombax*, *Moronobea* or *Ambelania* in an open area—a "lake" in the season of high water—covered with a very dense growth of tall grasses and sedges. The *seringueira tambaquí* in this locality is a small treelet about 20 feet tall with a crown of but two or three branches. The basal part of the trunk was characteristically swollen. There is, indeed, a striking parallel in the size and shape of the treelet and in the ecological factors between *Hevea microphylla* in this habitat and *H. pauciflora* var. *coriacea* (*H. minor*) at the mouth of the Río Guainía. I have never seen the tree (*Hevea microphylla*) as small as "ten feet," as reported by Baldwin (loc. cit.), but it becomes very small. This is due, without a doubt, to the almost permanent flooding of the locality and the resulting interference with normal growth habits.

Common names of Hevea microphylla

Hevea microphylla is most widely known as *seringueira tambaquí*. This name is used throughout its range.

In some parts of the Rio Negro, it is called *seringueira sarapó*. Both of these common names have reference to fish: the *tambaquí* is a relatively large and edible fish which often is found near the islands where, during the fruiting season, *Hevea microphylla* seeds provide a very rich and oily food as they fall into the water. The *serapó* has a pointed head and, according to Fróes, this rubber tree is called *seringueira sarapó* because of a rough resemblance of the pointed, conic capsule to the head of the fish.

In many localities of the Brazilian part of the Rio Negro, *Hevea microphylla* is called *seringueira barriguda*. This name, the same as applied to *Hevea Spruceana* in all its range, refers to the swollen basal portion of the trunk.

In several places along the Rio Negro, I have heard the natives refer to *Hevea microphylla* as *seringueira torada* or *seringueira de casca torada* [meaning "toasted"], referring to the dark tan-red color and the usual brittleness of the bark. By this term the tappers distinguish it from *Hevea Benthamiana* in their estradas, for the one is never tapped and the other is always an exploitable tree. This common name has also been reported for *Hevea Benthamiana* in the Rio Branco of Brazil.

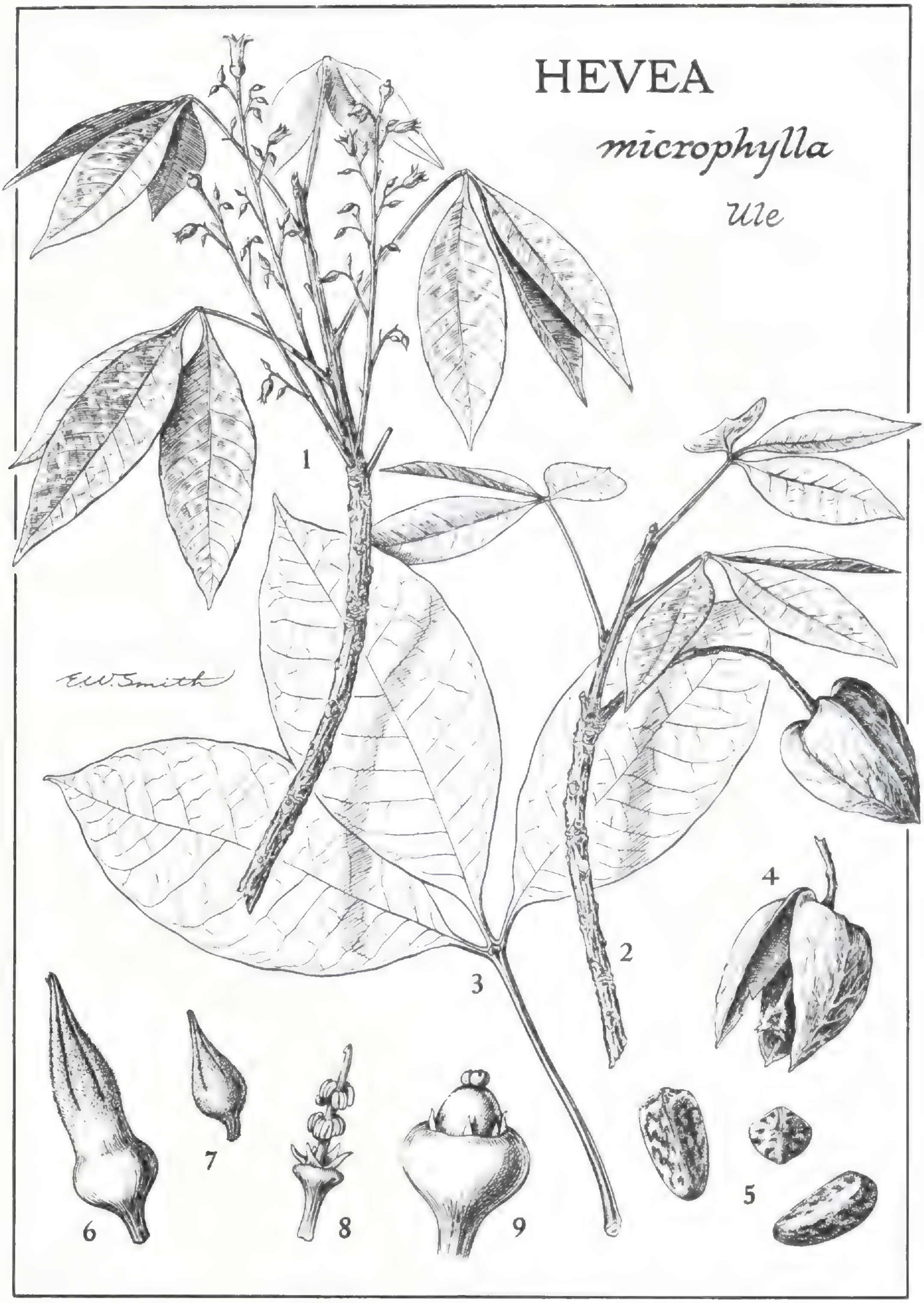
In Colombia and Venezuela, the name *seringa de mono* ("monkey's rubber") was given to me in two different localities. It is common practice in Amazonian Colombia to denote a plant as "false" or "useless" in this way; one species of *Herrania* (a non-chocolate producing relative of *Theobroma*), for example, is called *cacaito de mono*.

ILLUSTRATIONS

EXPLANATION OF THE ILLUSTRATION

PLATE XXXVI. HEVEA MICROPHYLLA *Ule*. 1 and 2, habit. 3, leaf showing departure from normal shape. 4, valves of capsule showing mode of dehiscence. 5, seed. 6, pistillate bud, showing terminal spiralling. 7, staminate bud. 8, staminate flower with calyx removed. 9, pistillate flower with calyx removed, showing large torus.

Drawn by ELMER W. SMITH


HEVEA
microphylla
Ule
E.W. Smith
1
2
3
4
5
6
7
8
9

EXPLANATION OF THE ILLUSTRATION

PLATE XXXVII. Leaf variations in *Hevea microphylla* Ule.

Drawn by ELMER W. SMITH

PLATE XXXVII

EXPLANATION OF THE ILLUSTRATION

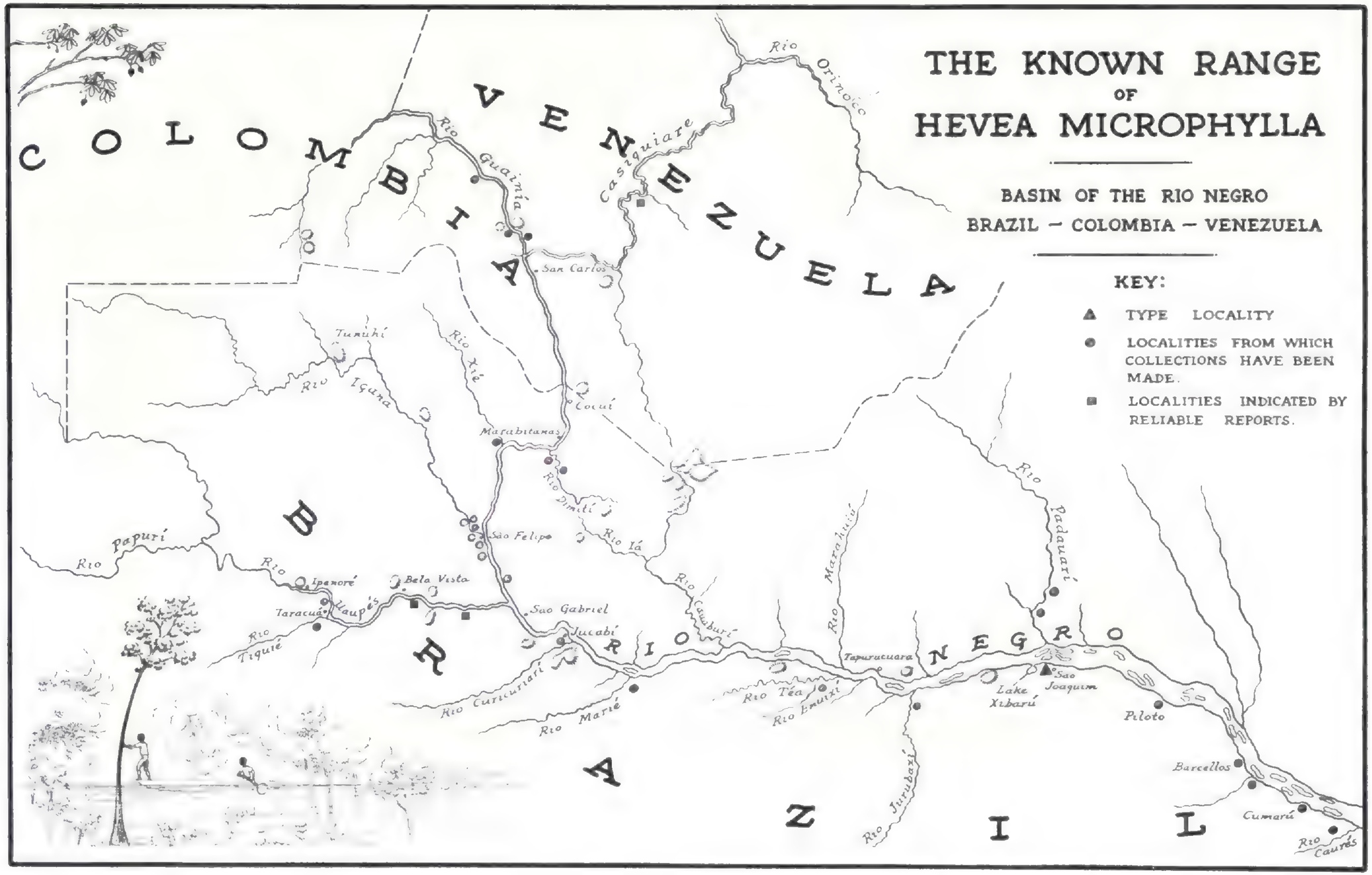
PLATE XXXVIII. Leafy shoots of *Hevea microphylla*, showing ripened fruits.

Plate XXXVIII

EXPLANATION OF THE ILLUSTRATION

PLATE XXXIX. Map showing the known range of *Hevea microphylla* Ule.

Drawn by ELMER W. SMITH


THE KNOWN RANGE
OF
HEVEA MICROPHYLLA
BASIN OF THE RIO NEGRO
BRAZIL – COLOMBIA – VENEZUELA
KEY:
TYPE LOCALITY
LOCALITIES FROM WHICH COLLECTIONS HAVE BEEN MADE.
LOCALITIES INDICATED BY RELIABLE REPORTS.
COLOMBIA
VENEZUELA
BRAZIL
RIO NEGRO
Rio Orinoco
Casiquiare
Rio Guainía
San Carlos
Tunuhí
Rio Xié
Rio Içana
Cocuí
Marabitanas
Rio Dimití
Rio Iá
São Felipe
Rio Papurí
Rio Ipanoré
Bela Vista
Taracuá
Rio Uaupés
Rio Tiquié
Sao Gabriel
Jucabí
Rio Curicuriarí
Rio Marié
Rio Cauaburí
Rio Marahuiá
Rio Padauarí
Tapurucuara
Rio Téa
Rio Enuixí
Rio Jurubaxí
Lake Xibarú
Sao Joaquim
Piloto
Barcellos
Cumarú
Rio Caurés

EXPLANATION OF THE ILLUSTRATION

PLATE XL. Upper figure. *Hevea microphylla*, showing the deeply floodable habitat normally inhabited by this species.

Lower figure. Trunk of *Hevea microphylla* showing the whip-shape and bellying of the basal portion.

Plate XL

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, FEBRUARY 21, 1952 VOL. 15, NO. 5

ORCHIDACEAE PERUVIANAE IX

BY
CHARLES SCHWEINFURTH

THE following article is the ninth in the series relating to the orchids of Peru. It consists of the descriptions of sixteen new species including those belonging to two new genera one of which represents a new subtribe.

The generic order follows the system proposed by Dr. Rudolf Schlechter in Notizblatt des Botanischen Gartens und Museums Berlin-Dahlem 9 (1926) 563–591.

Epidendrum breviracemum *C. Schweinfurth sp. nov.*

Herba parvula, epiphytica. Pseudobulbi breves, angusti, approximati, apice uni- vel bifoliati. Folium ovatum vel elliptico-ovatum vel ovato-oblongum, acutum, basi rotundatum vel subcordatum. Racemus terminalis, perbrevis, in anthesi recurvus, subumbelliformis, pauciflorus. Flores pro genere mediocres. Sepalum dorsale oblongo-lanceolatum vel elliptico-lanceolatum, acutum, mucronatum. Sepala lateralia oblique oblongo-lanceolata vel elliptico-lanceolata, dorso supra carinata. Petala linearia vel oblanceolato-linearia. Labellum columnae valde adnatum; lamina profunde trilobata; lobi laterales aliformes; lobus medius elliptico-ovatus vel ovato-lanceolatus, acutus vel acuminatus. Columna apice antice valde dilatata.

Plant small, epiphytic, up to 10 cm. tall. Roots fi-

brous, slender, glabrous, more or less elongate. Rhizome apparently abbreviated, woody. Pseudobulbs approximate, cylindric to fusiform, unifoliate or rarely bifoliate at the apex, about 3–5 cm. long, invested to above the middle with two to three imbricating tubular evanescent sheaths of which the uppermost is the largest, rather slender and striate-rugose in the dried specimen. Leaves ovate or elliptic-ovate to ovate-oblong, acute or subacute with a more or less conspicuous apicule, rounded to subcordate at the sessile base, about 4–8 cm. long, 2–2.7 cm. wide, commonly horizontally spreading, green above and red to dark purple beneath. Inflorescence terminal, abbreviated, up to 2 cm. long, recurved in anthesis, with a very short naked peduncle; raceme congested, umbelliform, about 3- to 8-flowered; floral bracts lanceolate or ovate-lanceolate, acuminate, concave, more or less shorter than the pedicellate ovary. Flowers small, but large for the plant, with widely spreading segments. Dorsal sepal oblong-lanceolate or elliptic-lanceolate, acute, mucronate, 3- or sometimes 5-nerved, 10–11.2 mm. long, 3.6–4 mm. wide, longitudinally convex. Lateral sepals obliquely oblong-lanceolate or elliptic-lanceolate, complicate-acute and mucronate with a prominent denticulate keel through the upper half, obliquely inserted at the base of the column, 3- or indistinctly 4-nerved, about 11–13 mm. long on the posterior margin and 3.6–4.2 mm. wide. Petals obliquely linear or oblanceolate-linear, acute, 1- to 3-nerved, about 9–11 mm. long and 1.3–1.9 mm. wide above the middle. Lip adnate to the column up to its apex; lamina deeply 3-lobed in about the middle, more or less deeply cordate at the base, about 4–5 mm. long in the center and 6.2 mm. wide across the lateral lobes; lateral lobes obliquely semiovate or aliform, acute to obtuse; mid-lobe more fleshy, elliptic-ovate or ovate and acute, rarely ovate-lanceolate and acuminate,

fleshy; disc with a pair of subglobose fleshy calli at the base. Column about 6.5 mm. long at the back, strongly dilated above in front, with a denticulate rarely crenulate clinandrium.

This little plant appears to be allied to several Venezuelan species, especially to *Epidendrum Arminii* Reichb.f. and to *E. Moritzii* Reichb.f. However, it differs from both in having much shorter broader leaves and a dissimilar mid-lobe of the lip.

CUZCO: Prov. of Urubamba, "Huiñaihuaina," Inca ruins, at 2550 meters altitude, epiphytic in forest, leaves purple beneath, perianth pinkish white, March 10, 1944, *C. Vargas 4122.*

JUNÍN: Prov. of Tarma, Agua Dulce, at 2400 meters altitude, on dwarf moss-covered trees in highland forest, abundant in restricted area, leaf above pale bluish green with purple central vein and 10 whitish parallel veins and uniform deep purple beneath with no marked veins, flowers pale flesh-red with reddish lines and dots, tip of petals and base of lip pale yellow-green, March 12, 1948, *F. Woytkowski Univ. Calif. Bot. Gard. (Berkeley) 4th Exped. Andes 39456* (TYPE in Herb. Ames No. 63152); same locality at 2000 meters altitude, on tree in low highland forest, stem dark red, leaf "thick, cushion-like, with sunken lines along rim; its surface is covered with tiny, sunken dots," beneath uniform dark red with similar tiny, sunken dots, sepals pale green with red lines, petals pale yellow, March 18, 1948, *F. Woytkowski Univ. Calif. Bot. Gard. (Berkeley) 4th Exped. Andes 35490.*

Epidendrum crassum *C. Schweinfurth sp. nov.*

Herba mediocris, saxicola. Caulis e basi decumbenti erectus, crassus, omnino paucifoliatus. Folia oblongo-ovata vel breviter oblonga, subacuta, vaginis imbricatis articulata. Inflorescentia erecta, quam folia multo longior, laxe paniculata cum ramis paucis substrictis. Flores parvi, longe pedicellati, in siccitate nigri. Sepala carnosa, tubulari-revoluta, expansa oblanceolata vel anguste obovata, lateralia obliqua et paulo longiora. Petala lineari-oblanceolata. Labellum convexum, transversum, plus-minusve profunde trilobatum, basi cordatum; lobi laterales ovato-semiorbiculares; lobus medius transversus. Columna brevis, apice antice valde dilatata.

Plant medium-sized, about 29 cm. tall. Roots fibrous, glabrous, whitish, few. Stem stout, erect from a decumbent base, entirely enveloped by loose scarious tubular sheaths which are imbricating and leaf-bearing except at the base, about 14 cm. high (not including the decumbent base). Leaves distichous, deciduous below, persistent near the apex of the stem, oblong-ovate or shortly oblong, ascending, subacute, up to 5 cm. long and 1.8 cm. wide, with a broad clasping base. Inflorescence much surpassing the leaves, suberect, loosely paniculate with few short ascending lateral branches, about 13.7 cm. long. Floral bracts lanceolate or linear-lanceolate, long-acuminate, spreading, up to 11 mm. long below, much shorter than the slender pedicellate ovary. Flowers small, numerous, loose, blackened in drying, with spreading perianth parts. Sepals fleshy, with strongly revolute sides. Dorsal sepal when expanded oblanceolate to narrowly obovate, acute with a dorsal mucro, prominently 3-nerved or indistinctly 5-nerved, up to about 8.1 mm. long and 3.9 mm. wide when expanded. Lateral sepals obliquely oblong-oblanceolate or oblong-obovate, with the mucronate apex somewhat recurved, 3- to 5-nerved, up to 9 mm. long and 3.7 mm. wide. Petals linear-oblanceolate, acute, lightly oblique, 1-nerved, up to 7.8 mm. long and 2 mm. wide. Lip adnate to the column up to its apex, convex, more or less deeply 3-lobed, broader than long, cordate at base, up to 4.4 mm. long from the center of the base to the middle of the mid-lobe and 6.6 mm. wide; lateral lobes ovate-semiorbicular with more or less lobulate margins; mid-lobe transversely subquadrate to irregularly semiorbicular, subtruncate to lightly retuse in front; disc bicallose at base. Column short, strongly dilated above in front, up to 5.5 mm. high at the back.

Apparently this species lacks any close allies.

The specific name is descriptive of the thickness of the stem, sepals and lip of this species.

PUNO: Prov. of Carabaya, "Ollachea a pte. Ackopampa," at 3100 meters altitude, on rocks or cliffs, December 31, 1947, *C. Vargas 6994* (TYPE in Herb. Ames No. 64897).

Epidendrum laceratum *C. Schweinfurth sp. nov.*

Herba nana, epiphytica. Caules graciles, simplices vel basi paulo ramosi, vaginis tubulatis maxima pro parte foliiferis omnino celati. Folia laxe disticha, patentia vel adscendentia, linearia, apice rotundato apiculata, basi amplectentia. Inflorescentia plusminusve sessilis, umbelliformis, pauciflora. Flores parvi, albi. Sepalum dorsale lineari-lanceolatum, abrupte acutum. Sepala lateralia oblique oblongo-lanceolata, apice complicata et mucronata. Petala elliptico-linearia, obtusa. Labellum columnae valde adnatum, in circuitu late ovatum cum partibus inferioribus utrinque conspicue lacerato-dentatis et tertia parte anteriore triangulari-ovata et obtusa. Columna brevis, recta, apice utrinque bidentata.

Plant dwarf, epiphytic, about 4.5 cm. high. Roots fibrous, slender, glabrous, at the base and lower portion of the stems. Stems simple or somewhat branched near the base, slender, lightly flexuous, entirely concealed by loose tubular sheaths which are slightly dilated above and (except for the lowermost ones) are leaf-bearing. Leaves distichous, spreading or ascending, linear, rounded at the apex with a more or less distinct apicule, sessile and clasping at the base, up to 2.1 cm. long and 2.5 mm. wide on the upper portion of the plant, often with revolute margins. Inflorescence sessile or subsessile, umbelliform, erect, with about five or less congested flowers. Floral bracts linear-lanceolate, acute, exceeding half of the bialate pedicellate ovary. Flowers small, white. Dorsal sepal linear-lanceolate, abruptly acute, about 5.5 mm. long and 1.2 mm. wide, 3-nerved. Lateral sepals ob-

liquely oblong-lanceolate, compliciate and mucronate at the apex, dorsally carinate, about 5.8 mm. long and 2 mm. wide, 3-nerved. Petals elliptic-linear, lightly oblique, obtuse, about 5 mm. long and 1.2 mm. wide, 1-nerved. Lip adnate to the column up to its apex, broadly ovate in outline, concave in the middle of the base, with a fold on each side in natural position, the lower two thirds on each side being prominently and irregularly lacerate-dentate and the anterior third triangular-ovate, entire and obtuse, indistinctly 3-nerved (with the mid-nerve prominent), lightly cordate at the base, about 4.8 mm. long and equally wide when expanded. Column short, straight, somewhat dilated in front, with two teeth on each side (the lower tooth much the larger), about 2.7 mm. long. Anther cordate-ovoid, 2-celled with each cell 2-chambered. Pollinia 4, complanate-pyriform.

This little species is apparently without close allies.

Cuzco: Prov. of Paucartambo, Sta. Isabel to Asunción, epiphyte at 1800 meters altitude, January 4, 1946, *C. Vargas 5583* (Type in Herb. Ames No. 63168).

Epidendrum subliberum *C. Schweinfurth sp. nov.*

Herba pusilla, epiphytica, ramosa. Caulis ramosus; rami breves, vaginis arctis imbricatis obtecti. Folia plura, prope ramorum apicem congesta, linearia, apice complicato mucronata, rigida. Inflorescentiae terminales, unicae, pendulae, racemosae. Racemi subdense multiflori. Flores perparvi. Perianthii partes patentes vel reflexae. Sepalum dorsale ovale vel oblongo-ellipticum, obtusum. Sepala lateralia similia, leviter obliqua, subacuta. Petala multo angustiora, oblique lanceolata, subacuta. Labellum columnae basi adnatum, transversum, in circuitu perlate ovatum, antice trilobatum; lobi laterales comparate magni, late patentes, ovato-rotundati; lobus medius comparate parvus, semiorbicularis. Columna parva, recta.

Plant small, slender, branching, epiphytic, about 17.5 cm. tall from the base of the stem to the tip of an erect leaf. Roots numerous, fibrous, glabrous, near or at the very base of the stem. Stems about 10 cm. or less high, consisting of short mostly strict branches; branches slender or somewhat thickened above, entirely concealed by imbricating tubular evanescent sheaths of which the upper three or four are leaf-bearing. Leaves erect-ascending, linear, mucronate at the apex, clasping at the sessile conduplicate base, up to 7.5 cm. long and 5 mm. wide, shining. Inflorescences terminal on the upper branches, solitary, pendent, racemose, about 8.6 cm. or less long; peduncle very short, bearing several small lanceolate long-attenuate bracts; racemes subdensely many-flowered, about 8 cm. or less long. Floral bracts lanceolate, long-attenuate, exceeding one half of the slender glabrous pedicellate ovary. Flowers very small, "dark blue," with widespreading or reflexed segments. Dorsal sepal oval or oblong-elliptic, obtuse, prominently 1-nerved with a pair of short lateral indistinct nerves, about 3.4 mm. long and 2 mm. wide. Lateral sepals similar, subacute, lightly oblique, slightly broader above, about 3.8 mm. long and 2 mm. wide. Petals much narrower than the sepals, obliquely lanceolate, subacute, about 3.5 mm. long and 1.2 mm. wide, 1-nerved, with somewhat irregular margins. Lip adnate to the base of the column, transverse, from an abbreviated broadly cuneate claw abruptly dilated into the lamina, about 4.2 mm. long; lamina distinctly 3-lobed in front, subcordate at base, about 6 mm. wide, with irregular margins; lateral lobes relatively large, obliquely ovate-rounded, horizontally spreading; mid-lobe relatively small, semiorbicular, about 1 mm. long and 2 mm. wide at base, 3-nerved with the lateral nerves branching. Column small, about 2 mm. high. Anther 2-celled, with each cell 2-cham-

bered. Pollinia 4, complanate, obliquely suborbicular.

This little species appears to be without close allies. Whereas its vegetative aspect clearly suggests a member of the section *Euepidendrum*, the almost free lip is abnormal and remarkable.

The specific name is in allusion to the character of the lip.

Cuzco: Prov. of Paucartambo, Pillahuata, epiphyte in rain-forest, at 3400 meters altitude, December 11, 1942, *C. Vargas 3011* (Type in Herb. Ames No. 63167).

Epidendrum tenuispathum *C. Schweinfurth sp. nov.*

Herba elata, epiphytica. Caulis crassus, distichifolius. Folia lanceolata vel oblongo-lanceolata vel elliptico-lanceolata, acuta, basi amplexicaulia, late patentia. Inflorescentia terminalis, paniculata, basi spatha scariosa magna obtecta. Flores pro genere minores, perianthii partibus patentibus. Sepalum dorsale elliptico-oblanceolatum, subacutum. Sepala lateralia late et oblique elliptico-oblanceolata, dorso carinata cum carina in mucronem producta. Petala oblanceolato-linearia, leviter curvata, acuta. Labellum columnae valde adnatum; lamina prope medium profunde trilobata; lobi laterales rotundato-dolabriformes; lobus medius brevis, latus, retusus cum mucrone in sinu; discus basi bicallosus. Columna arcuata, antice supra valde dilatata.

Plant tall, epiphytic, 0.6–0.9 m. high, according to the collector's notes. Stem stout, altogether concealed by the sheaths of the leaves. Leaves distichous, apparently numerous (six in the specimen present), 4 cm. or less apart, widely spreading, lanceolate to elliptic-lanceolate or oblong-lanceolate, acute and minutely apiculate, amplexicaul below, chartaceous in the dried specimen, about 8–13 cm. long, 2.3–2.9 cm. wide. Inflorescence terminal, erect, loosely paniculate, apparently lacking

any free peduncle, with the rachis about 16 cm. long, the lowest branch erect and mostly concealed by a loose scarious conduplicate spathe about 6 cm. long. Floral bracts mostly linear-lanceolate, scarious, more or less shorter than the slender glabrous pedicellate ovary. Flowers rather small for the genus with spreading segments, with the ovary, sepals, and petals dark red, and the lip pink to white. Sepals 3-nerved or obscurely 5-nerved below. Dorsal sepal elliptic-oblanceolate, subacute, about 1.5 cm. long and 5–5.6 mm. wide. Lateral sepals broadly and very obliquely elliptic-oblanceolate, acute, dorsally carinate with the keel produced into a prominent mucro, about 1.63 cm. long measured along the posterior portion and 6 mm. wide. Petals obliquely oblanceolate-linear to linear-spatulate, more or less curved, acute at the sometimes rounded apex, 1-nerved, about 1.35 cm. long and 2–2.6 mm. wide above. Lip adnate to the column up to its apex; lamina conspicuously 3-lobed near the middle, cordate at the base, retuse and bluntly apiculate at the apex (of the mid-lobe), about 9 mm. long through the middle and 14–17.5 mm. wide across the lateral lobes when expanded; lateral lobes obliquely rounded-dolabriform, with the outer margins minutely and irregularly crenulate; mid-lobe short, much broader than long, from a broad base more or less abruptly dilated into a pair of short rounded minutely crenulate lobules; disc at base with a pair of small fleshy calli and thickened through the middle. Column strongly and abruptly dilated in front from below the middle, rounded-retuse at the apex, about 6.8 mm. long at the back.

This species differs from the Colombian *Epidendrum Sanctae Martae* Schltr. in having broader leaves, an indistinct (rather than elongate) peduncle, as well as in dissimilar petals and lobes of the lip. It varies from the

Colombian *E. tovarense* Reichb.f. in having more numerous leaves, an indistinct peduncle, and relatively elongate floral bracts.

HUANCAVELICA: Prov. of Tayacaja, Ampurco woods, on trail between Salcabamba and Surcubamba, at 2900 meters altitude, common epiphyte on mossy tree trunk, January 15, 1939, *H. E. Stork and O. B. Horton 10427* (TYPE in Herb. Ames No. 65457).

Orleanesia peruviana *C. Schweinfurth sp. nov.*

Herba pro genere mediocris. Rhizoma radicesque desunt. Caulis crassus, erectus, vaginis tubulatis imbricatis omnino celatus. Folia angusta, laxe disticha, late patentia, in siccitate conduplicata, oblongo-lanceolata vel lanceolato-linearia, apice inaequaliter bilobulata. Pedunculus semisigmoideus, vaginis tubulatis arctis multis ornatus. Inflorescentia laxe paniculata cum ramis paucis brevibus paucifloris. Flores parvi. Sepalum dorsale ovato-lanceolatum, breviter acuminatum. Sepala lateralia breviora sed latiora, oblique oblongo-ovata, acuta. Petala linearia, leviter decurva. Labellum simplex, late obovatum, apice leviter retuso-truncatum, basi cuneatum, ecallosum. Columna brevis, arcuata, bialata, in pedem brevem extensa.

Plant medium-sized for the genus. Rhizome and roots lacking in our specimen. Stem erect, apparently stout, about 18 cm. tall, entirely concealed by about 10 tubular imbricating sheaths which are largest in the middle, and all except the lower ones leaf-bearing. Leaves narrow, loosely distichous, conduplicate in the dried plant, wide-spreading and lightly decurved, oblong-lanceolate to lanceolate-linear when expanded, abruptly and unequally bilobulate at the apex, 6.5–13.3 cm. long, about 1 cm. wide or less when viewed from the side, rigid-coriaceous. Peduncle in our specimen semisigmoid, about 27 cm. long, adorned with 15 close tubular scarious sheaths which are larger and imbricating at the base, and

gradually smaller and more separate above. Inflorescence nodding, loosely paniculate with three or four short lateral branches; branches apparently 4-flowered, with a rachis about 1 cm. long. Bracts semiamplexicaul, broadly ovate, concave, acute, those subtending the branches much larger than the floral bracts. Flowers small, "mignonette and dark violet," distinctly pedicelled. Dorsal sepal ovate-lanceolate, short-acuminate, 6.5–7 mm. long, about 2.6 mm. wide when expanded, with revolute or recurved sides. Lateral sepals shorter and broader than the dorsal sepal, obliquely oblong-ovate, acute and apiculate, about 6 mm. long and 3 mm. wide. Petals obliquely linear, acute, slightly decurved, 6–6.5 mm. long, 0.9–1 mm. wide. Lip adnate to the column-foot, broadly obovate, retuse-truncate and apiculate at the apex, cuneate at the base, ecallose, with the upper margins on each side irregularly crenulate-erose, 6.5–6.9 mm. in greatest length, 5.5–5.8 mm. wide near the middle. Column short, stout, lightly arcuate, broadly winged especially above, concave in front, 3-toothed at the apex, about 4 mm. high at the back, extended into a short stout foot. Anther incumbent, semiovoid, 2-celled with each cell divided into two chambers. Pollinia 4, complanate, with the outer ones smallest. Pedicel and ellipsoid ovary finely pubescent.

This species, representing a genus hitherto unrecorded from Peru, seems to be allied to the Brazilian *Orleanesia yauaperyensis* Rodr. However, it differs from that species in having eight leaves instead of four, in having larger (especially broader) blades which are obtuse and bilobulate, rather than acute. The flowers of this plant are also rather smaller than in the Brazilian species.

Loreto: Vicinity of Iquitos, at 100 meters altitude, on dead tree in clearing, November–December 1936, *G. Klug 10021* (Type in Herb. Ames No. 62029).

Vargasiella *C. Schweinfurth gen. nov.*

Divisio: Acrotonae. Tribus: Kerosphaereae. Series: Aeranthae. Flores mediocres. Perianthii partes liberae, patentes, subcarnosae. Sepala ovato-oblonga (raro oblonga). Petala ovato-elliptica, paulo breviora. Labellum simplex, arcuato-recurvum, columnae pedi affixum, marginibus anterioribus valde undulatis. Columna brevis, crassa, quam segmenta cetera duplo brevior, in pedem brevem extensa. Anthera parva, incumbens, galeata. Pollinia quattuor, cereacea, parva, per paria inaequalia, valde complanato-subglobosa.

Herba epiphytica vel terrestris. Caulis elongatus, basi decumbens et rhizomatosus radices breves sparsas tomentosas infra producens, cum ramis unicis vel perpaucis strictis, supra plurifoliatus. Folia plusminusve elliptica, convoluta, vaginis articulata. Inflorescentia unica, e folii superioris axilla exoriens, laxe pluriflora, folia valde superans.

Vargasiella peruviana *C. Schweinfurth sp. nov.*

Herba gracilis, mediocris. Caulis vaginis tubulatis evanidis omnino tectus, supra foliis pluribus ornatus. Folia disticha, elliptica vel oblongo-elliptica vel elliptico-lanceolata, articulata. Inflorescentia subterminalis, laxe racemosa. Sepalum dorsale ovato-oblongum, complicato-acutum vel mucronatum, concavum. Sepala lateralia similia, acuta, conspicue mucronata, cymbiformia, dorso carinata, quam sepalum dorsale paulo majora. Petala elliptico-ovata, acuta. Labellum simplex, in positu naturali arcuato-recurvum et columnae parallelum, expansum ovato-oblongum, basi cordatum, apice rotundato abrupte acutum. Columna brevis, crassa.

Plant slender, terrestrial or epiphytic. Stem elongate, many-jointed, decumbent and rhizomatose below, with one or few strict branches near the middle, entirely con-

cealed by tubular sheaths which waste away into fibres except in the leafy upper portion, below producing scattered roots which are fibrous, stout, apparently short, mostly simple and densely tomentose (especially when young). Leaves several, on the upper portion of the stem, congested when young and scattered at maturity, distichous, convolute, elliptic to oblong-elliptic or elliptic-lanceolate, acuminate, cuneate below, sessile or indistinctly petioled, articulated to close tubular sheaths, membranaceous, with three to five nerves more prominently exserted beneath, 5.6–13.5 cm. long, about 2–2.5 cm. wide, increasing in size from the lowermost leaves up to the median ones. Inflorescences much surpassing the leaves, arising from the axil of an upper leaf, erect or nearly so, racemose above, up to about 33.5 cm. long; peduncle about 21.4 cm. long, provided with several remote sheaths which are tubular below and lanceolate-acuminate above; raceme loosely about 15-flowered or less; floral bracts oblong, acute, spreading, up to 1.4 cm. long. Flowers medium-sized, with campanulate-spreading segments, subfleshy. Dorsal sepal ovate-oblong, complicate-acute or mucronate, concave, 5-nerved, with the margins (especially above) very minutely cellular-erose, about 1.32 cm. long and 6 mm. wide. Lateral sepals similar, ovate-oblong, acute, cymbiform, dorsally carinate with the keel produced into a conspicuous mucro, 5- or 6-nerved, lightly oblique, about 1.45 cm. long and 7 mm. wide near the concave base. Petals elliptic-ovate, acute, apiculate, 5-nerved, about 1.2 cm. long and 6 mm. wide. Lip simple, arcuate-recurved and parallel to the column with the sides erect in natural position, articulated to the column-foot, nearly equaling the lateral sepals, with the anterior margins strongly undulate, about 1 cm. long and 6 mm. wide when expanded; disc when forcibly expanded ovate-oblong, cordate at the base,

rounded and acute or abruptly apiculate at the tip, with a pair of fleshy callose thickenings (which are more or less radiantly lobed below) in the lower half. Column short, stout, with a narrow fleshy wing on each side throughout, subtruncate above, about 7 mm. high at the back, produced at the base at a right angle into a short fleshy ovate-oblong foot. Anther relatively small, galeate, 1-celled. Pollinia 4, in two unequal pairs, without appendages, strongly complanate-subglobose, waxy. Ovary prominently 6-sulcate.

This concept has a very distinctive appearance, but seems to lack affinity with any genus known to me. It appears to be abnormal in respect to the inflorescence which must be interpreted as being pseudoterminal in the axil of an upper leaf. Yet it surely does not represent the truly lateral inflorescence characteristic of Schlechter's series Pleuranthae. The pollinia appear to be entirely without appendages, either viscid disc or caudicle, and thus to indicate a relationship to the subtribe Liparideae. However, it differs from all members of that subtribe (except from certain equitant-leaved plants of the Old World), in having articulated leaves and subfleshy or firm flowers. I therefore propose a new subtribe, **Vargasielleae,** to be inserted in Schlechter's arrangement before the Liparideae.

It is with great pleasure that I dedicate this genus to Dr. César Vargas of Cuzco, Peru, whose wide explorations in that country, often in the face of serious obstacles, have added immeasurably to our knowledge of the Peruvian orchid flora.

Cuzco: Prov. of Paucartambo, Pillahuata, epiphyte in rain-forest, at 3400 meters altitude, floral segments white lined with pink, December 11, 1942, *C. Vargas 3010;* Prov. of Convención, hills of Pintobamba, in humus of forest, at about 2400 meters altitude, perianth white with pinkish lip, March 3, 4, 1943, *C. Vargas 3288* (Type in Herb. Ames No. 65952).

Buesiella *C. Schweinfurth gen. nov.*

Divisio: Acrotonae. Tribus: Kerosphaereae. Series: Pleuranthae. Flores minuti, racemosi. Perianthium campanulatum, partes liberae. Sepala oblonga vel elliptico-oblonga, cymbiformia. Petala ovali-ovata, leviter concava. Labellum non crassum, simplex, panduratum, columnae rigide affixum, medio bicarinatum. Columna conspicua, clavata, supra non alata, apoda. Anthera incumbens, galeata. Pollinia duo, oblique pyriformia, cereacea, sine stipite et caudicula ut videtur.

Herba epiphytica, rhizomatosa. Pseudobulbi approximati, pergraciles, unifoliati. Folia angustissima. Inflorescentiae laterales, basales, racemosae.

Buesiella pusilla *C. Schweinfurth sp. nov.*

Herba parva, gracilis, epiphytica, rhizomatosa. Radices fibrosae, comparate crassae. Pseudobulbi numerosi, approximati, in siccitate pergraciles, apice unifoliati. Folia anguste linearia, plusminusve conduplicata. Inflorescentiae laterales, basales, supra laxe racemosae et pauciflorae. Flores minuti. Perianthii partes liberae, campanulatae. Sepala cymbiformia, uninervia. Sepalum dorsale elliptico-oblongum. Sepala lateralia oblonga, paulo longiora et angustiora. Petala ovali-ovata, sepalis latiora. Labellum columnae adnatum, simplex, longitudinaliter concavum, expansum panduratum, acutum, medio bicarinatum. Columna valde clavata. Anthera incumbens, galeata. Pollinia duo, oblique pyriformia.

Plant small, slender, epiphytic, with an ascending rhizome which is concealed by evanescent sheaths. Roots relatively stout, fibrous, glabrous, whitish, more or less elongate. Pseudobulbs numerous, approximate, very slender and striate-rugose in the dried specimen, cylindric, unifoliate at the apex, about 2–3.3 cm. long, sometimes curved, subparallel with the rhizome. Leaves nar-

rowly linear, more or less conduplicate (especially below), acute or subacute, gradually long-narrowed below, gently recurved in the dried specimen, up to 19 cm. long and 4.5 mm. wide above the middle. Inflorescences lateral at the base of the pseudobulbs, filiform, suberect, sometimes arcuate above, racemose in the upper part, clothed below the raceme with several imbricating foliaceous sheaths when young, about 8 cm. or less long; raceme few- (3- to 9-) flowered, loose. Floral bracts infundibuliform, long-acuminate, scarious. Flowers minute, membranaceous, with the perianth campanulate. Sepals free, cymbiform with lightly saccate base, 1-nerved, dorsally carinate. Dorsal sepal elliptic-oblong when expanded, subacute, about 3 mm. long and 1.6 mm. wide. Lateral sepals oblong, subacute, about 3.5 mm. long and 1 mm. wide. Petals oval-ovate, acute, 1-nerved, lightly concave, about 3 mm. long and nearly 2 mm. wide. Lip subparallel to the column, adnate to the column, longitudinally concave in natural position, simple, pandurate, with the anterior half triangular-ovate and acute, and the slightly narrower posterior portion rounded at the base, about 2.7 mm. long and 1.4 mm. wide across the ovate part; disc thickened through the center below, the thickening expanded into a pair of erect semirhombic keels in the middle. Column stout, strongly dilated above (and thus clavate) but not winged, about 1.6 mm. high at the back. Anther galeate, obovoid. Pollinia 2, waxy, obliquely pyriform, apparently without either stipe or caudicles.

This little plant is remarkable for having flowers with an apparent lack of both a viscid disc and caudicles to the pollinia. It is referable to Schlechter's *Pleuranthae* and it appears to be allied to his subtribe *Bulbophylleae*. However, it is quite different from any of the genera that have been assigned to that group in having a membra-

naceous lip rigidly attached to the base of the column, and a column without either wings or foot.

We have named this little species for an assiduous collector of Peruvian plants.

Cuzco: Ccochapampa, at the height of Ccochayoc, at 1000 meters altitude, February 21, 1931, *C. Bues s.n.* (Type in Herb. Field Mus. No. 660010).

Xylobium latilabium *C. Schweinfurth sp. nov.*

Herba magna, epiphytica ut videtur. Pseudobulbus oblongo-pyriformis vel cylindraceus, unifoliatus. Folium conspicue petiolatum; lamina oblanceolato-oblonga, abrupte acuta, cum nervis tribus conspicuis; petiolus longus, gracilis. Inflorescentia crassa, erecta, brevis, supra densius racemosa, cum floribus grandibus luteis. Sepalum dorsale lanceolato-oblongum. Sepala lateralia multo majora, obliquissime triangulari-ovata et falcato-decurva, dorso superne carinata. Petala oblongo-lanceolata, sepalis minora. Labellum columnae pedi adnatum, prope apicem trilobatum, in positu naturali tubulari-concavum, cum lobis lateralibus semiobovatis erectis; lobus medius subquadratus vel ovato-subquadratus, latior quam longior; discus callo centrali oblongo apice lobulato percursus et lineis verrucosis ornatus. Columna perbrevis, in pedem longum extensa.

Plant large, apparently epiphytic. Rhizome stout, woody, only a fragment present in our specimen. Roots fibrous, glabrous, stout. Pseubobulb oblong-pyriform or cylindric, striate-sulcate in the dried specimen, unifoliate, about 6.5 cm. long. Leaf conspicuously petioled; lamina oblanceolate-oblong, rather abruptly acute, long-cuneate below, with three nerves very prominent beneath, about 43 cm. long and 7.8 cm. wide above the middle, chartaceous; petiole slender, deeply channelled, subterete below, about 10 cm. long. Inflorescence short, stout, erect, about 15 cm. high (separated and incom-

plete at the base in our specimen); peduncle mostly concealed by three or more imbricating sheaths which are loose, scarious and apparently finely maculate; raceme rather densely many- (20-) flowered, about 8.5 cm. long. Floral bracts narrowly lanceolate, scarious, concave, about equaling the pedicellate ovary. Flowers vivid yellow, waxy, with spreading segments, rather large for the genus. Sepals with strongly revolute margins. Dorsal sepal narrowly lanceolate-oblong, obtuse or subacute, about 1.8–1.95 cm. long and 5.5–7 mm. wide. Lateral sepals much larger than the dorsal sepal, very obliquely triangular-ovate and falcate-decurved, acute, about 2 cm. long measured along the posterior part and 1.3–1.5 cm. wide near the base, forming a prominent mentum with the column-foot, dorsally carinate above the middle. Petals oblong-lanceolate, obtuse or abruptly acute, lightly oblique, about 1.7 cm. long and 4.5–5.5 mm. wide. Lip attached to the foot of the column near its apex, 3-lobed near the front, tubular-concave with erect-incurved lateral lobes in natural position, suborbicular in outline when expanded, about 1.8 cm. long in the middle and subequally wide or wider when expanded; lateral lobes semiobovate (including the basal portion), terminating in a truncate crenulate apex (without a free portion); mid-lobe porrect, subquadrate or ovate-subquadrate, broader than long, retuse to rounded in front, about 5 mm. long and 8.1 mm. wide; disc adorned with a broad central oblong apically lobulate callus and with numerous verrucose fleshy lines above the nerves. Column very short and stout, about 6 mm. long, produced into an elongate foot about 1 cm. or more in length.

This species appears to lack any close allies. Superficially it would pass for a form of *Xylobium squalens* (Lindl.) Lindl., but the large flowers and the lip are very different.

Junín: Prov. of Tarma, Vitoc, "eyebrow of the jungle," at 1800 meters altitude, "lip petal inside has 8 purple lines on each side," *F. Woytkowski 10* (Type in Herb. Ames No. 65456).

It seems very probable that the following collection, which is represented in the Ames Herbarium by a photograph of a flowering specimen accompanied by floral drawings and notes, is referable to this concept. Its data are:

Ost-Peru: Stromgebiet des Maranon von Iquitos aufwärts bis zur Santiago-Mündung am Pongo de Manseriche, ca. 77°30′ West, Mündung d. Santiago, Flutfreier Hochwald, 160 m. Höhe u. d. M., Bl. hellgelb, am den Innenseiten der Seitenlappen der Lippe mit karminen Adern, auf einer Liane in 4 m. Höhe, 11 November 1924, *G. Tessmann 4516*.

Lycaste longisepala *C. Schweinfurth sp. nov.*

Herba verisimiliter epiphytica, magna. Rhizoma repens. Pseudobulbi congesti, oblongo-ovoidei vel anguste ellipsoidei, apice tri- vel quadrifoliati. Folia elliptica vel anguste lanceolato-elliptica, acuta vel acuminata, infra sensim petiolato-angustata. Scapus foliis multo brevior, lateralis, uniflorus. Flos nutans, cum sepalis perlongis patentibus. Sepala similia, elliptico-lanceolata, acuminata, lateralia inferne obliqua et mentum saccatum formantia. Petala multo minora, erecta, expansa elliptico-oblonga, acuta. Labellum leviter recurvum, medio distincte trilobatum cum lobis lateralibus parvis erectis; lobus medius rotundato-ovatus, apice late rotundatus, cum marginibus eroso-crenulatis; discus infra medio carnoso-carinatus et medio callo plano ovato-oblongo ornatus. Columna gracilis, infra in pedem brevem latum extensa.

Plant large, with a creeping rhizome. Pseudobulbs closely approximate, oblong-ovoid to narrowly ellipsoid, 3- or 4-leaved at the apex (the young shoot shows five leaves), longitudinally sulcate in age, up to 10.8 cm. long. Leaves elliptic to narrowly lanceolate-elliptic,

acute to acuminate, gradually narrowed below to an indistinct deeply channelled petiole (up to 7.6 cm. long), with several conspicuous ribs, up to about 46.3 cm. long including the petiole and 8.9 cm. wide. Scape lateral, 1-flowered, erect, clothed with three remote tubular sheaths, about 20.6 cm. high. Pedicellate ovary plurisulcate, recurved, shorter than the erect tubular-infundibuliform bract which is similar to the upper sheath. Flower nodding, very large, with spreading sepals. Sepals "bronze-tan" on inner surface. Dorsal sepal elliptic-lanceolate, subacuminate, concave below, about 8.9–10 cm. long and 2.15 cm. wide. Lateral sepals similar, elliptic-lanceolate or oblong-lanceolate, acuminate, oblique at the base and forming a spur-like mentum with the column-foot, about 9–10 cm. long measured along the posterior margin and 2–2.2 cm. wide in the middle. Petals much smaller than the sepals, erect with recurved apex in natural position, pale creamy yellow shading to white at the apex, when expanded elliptic-oblong, acute, oblique at the base, about 4.4–4.8 cm. long and 1.6–2 cm. wide near the middle. Lip gently recurved with the sides of the lower half incurved in natural position, within, golden yellow at the base, lighter in the middle and then maroon extending to the white tip; lamina when expanded oblong-elliptic, sharply but not deeply 3-lobed in the middle, narrowly cuneate below, about 4.6–5 cm. long and 1.9 cm. wide across the lateral lobes; lateral lobes narrowly semiobovate, with a short rounded crenulate free apex; mid-lobe round-ovate to oblong-ovate, with erose-crenulate margins, broadly rounded in front, about 2.1–2.4 cm. long and 1.8 cm. wide, separated from the lateral lobes by a narrow sinus; disc with a narrow callose line in the middle below and with a broad oblong-ovate callus between the lateral lobes. Column slender, about 1.7–1.9 cm. high at the back, finely velutinous,

produced into a short somewhat broader foot which is about 9 mm. long.

This concept appears to be remarkable in its genus by reason of the elongate sepals and much shorter petals. It was described from a photograph, and notes of the vegetative parts, together with a flowering scape preserved in liquid, supplied by the University of California Botanical Garden (Berkeley), culture no. 50.1896.

PERU: Sariapampa (?), *Woytkowski 289.*

Zygopetalum Klugii *C. Schweinfurth sp. nov.*

Herba epiphytica, pro genere mediocris, rhizomate abbreviato. Folia plura, in circulo flabelliformi, ad vaginas conduplicatas articulata; lamina oblongo-obovata vel oblongo-oblanceolata, abrupte acuta, infra sensim angustata. Inflorescentiae breves, uniflorae. Flos pro genere parvus, segmentis patentibus. Sepalum dorsale oblongo-lanceolatum, acuminatum. Sepala lateralia majora, oblique lanceolata, acuminata. Petala elliptico-lanceolata, acuminata, sepalo dorsali paulo minora. Labellum breviter unguiculatum, in hypochilium et epichilium divisum; hypochilium conduplicato-concavum, antice digitiformi-fimbriatum; epichilium elliptico-lanceolatum, acuminatum. Columna conspicua, infra late bialata.

Plant epiphytic, medium-sized for the genus, without or with an abbreviated rhizome, without pseudobulbs or apparent stems. Roots fibrous, rather slender, glabrous, whitish. Leaves several in a flabelliform cluster, articulated to conduplicate basally imbricating sheaths the outer members of which are much smaller with abbreviated or no blades; lamina oblong-obovate to oblong-oblanceolate (rarely an abbreviated outer blade is ovate), abruptly acute, long-narrowed below, membranaceous, with three to seven nerves exserted beneath, up to 26 cm. long and 5.5 cm. wide (the uppermost blade longest

and relatively narrower than the others). Inflorescences about five in our specimen, basal in the axils of sheaths, relatively short, 1-flowered; peduncles filiform, provided below with several loose tubular scarious sheaths, about 5.5 cm. or less long. Flower rather small for the genus, white and whitish green, with spreading segments. Dorsal sepal oblong-lanceolate, acuminate, 7-nerved, about 2.24 cm. long and 7.6 mm. wide. Lateral sepals very obliquely lanceolate with the dorsal margin nearly straight and the anterior margin broadly rounded, acuminate, 9-nerved near the base, about 2.68 cm. long and 1 cm. wide near the concave base. Petals elliptic-lanceolate, lightly oblique, acuminate, 6- or 7-nerved near the base, about 2.1 cm. long and 7 mm. wide. Lip about 2.4 cm. long in natural position, shortly clawed, sharply divided into a hypochile and epichile; claw short, broad, fleshy, sulcate, about 2 mm. long; hypochile conduplicate-concave with the broadly rounded anterior margin irregularly digitiform-fimbriate, the center within having a low fleshy keel which is irregularly dilated near the apex; epichile attached to the back of the hypochile in the middle, elliptic-lanceolate, acuminate with a complicate apex, about 9-nerved, lightly concave, about 1.8 cm. long and 7 mm. wide. Column conspicuous, extended in front into an indistinct broad fleshy foot, about 1.6 cm. high at the back, broadly winged on each side through the lower half, the wings being gradually dilated upward to an abruptly truncate tip.

This species differs from *Zygopetalum lucidum* Rolfe from British Guiana and Venezuela in having broader leaves, more membranaceous flowers, narrower petals, and dissimilar features of the lip.

Loreto: Vicinity of Iquitos, epiphyte at 100 meters altitude, July 1937, *G. Klug 10109* (Type in Herb. Ames No. 65442).

Maxillaria angustibulbosa *C. Schweinfurth sp. nov.*

Herba epiphytica, cum rhizomate repenti flexuoso, adscendenti. Pseudobulbi distantes, peranguste cylindracei, apice unifoliati, vagina conduplicata foliifera utrinque velati. Folia elliptico-oblonga vel anguste lanceolato-oblonga, acuta, breviter petiolata. Inflorescentiae singulae, laterales, uniflorae, cum pedunculo vaginis pluribus ventricosis fere omnino obtecto. Flos minor. Sepalum dorsale valde concavum, oblongo-ovatum, acutum. Sepala lateralia oblique ovato-triangularia, acuta, cum columnae pede mentum conspicuum formantia. Petala sepalo dorsali similia, basi obliqua. Labellum in circuitu oblongo-ellipticum, supra medium leviter trilobatum; lobi laterales angusti, erecti, apice semiorbiculares; lobus medius oblongo-ovatus, late obtusus, valde carnosus. Columna brevis, crassus, in pedem longum extensa.

Plant epiphytic, with an ascending creeping rhizome. Rhizome flexuous, entirely invested by close imbricating scarious sheaths. Roots numerous, fibrous, filiform, branching, glabrous. Pseudobulbs obliquely inserted on the rhizome and subparallel to it, apparently about 4 cm. apart, linear-cylindric, strongly complanate, unifoliate at the apex, finely rugose-striate (in the dried specimen), about 4 cm. long, the lower part on each side concealed by one or two conduplicate leaf-bearing sheaths. Leaves more or less petioled; lamina elliptic-oblong to narrowly lanceolate-oblong, acute, cuneate-narrowed to the base, up to 16 cm. long and 1.8 cm. wide, that on the pseudobulb longer and narrower than those present on the surrounding sheaths, thinly chartaceous; petiole slender, channelled, up to 2.2 cm. long (on the pseudobulb). Inflorescences solitary, lateral, at the base of a leaf-bearing sheath below the pseudobulb, ascending, 1-flowered,

more or less shorter than the leaves, almost entirely concealed by several ventricose imbricating sheaths which become much shorter near the base. Flower rather small, yellow, with somewhat spreading segments. Dorsal sepal oblong-ovate, strongly concave, acute, complicate-mucronate and dorsally carinate at the apex, about 1.3 cm. long and 6.4 mm. wide. Lateral sepals very obliquely ovate-triangular, acute and dorsally carinate at the apex, about 1.3 cm. long on the posterior margin, forming a conspicuous mentum with the column-foot, about 8.6 mm. wide at the base. Petals similar to the dorsal sepal, oblong-ovate, shortly acuminate, long-adherent to the column at the oblique base, about 1.1 cm. long and 5.8 mm. wide. Lip in natural position erect, parallel to the column and lightly recurved, when expanded oblong-elliptic in outline, more or less 3-lobed above the middle, about 1.1 cm. long and 4.6 mm. wide; lateral lobes erect, narrow, broadly rounded above; mid-lobe oblong-ovate, broadly obtuse, fleshy-thickened with the mid-nerve carinate beneath, about 3 mm. long and 3 mm. wide, with minutely irregular margins: disc with a central longitudinal thickening which passes into a prominent linear-oblong sulcate callus. Column short, stout, clavate, sulcate in front, about 5 mm. high at the back, extended into a much longer apically upcurved foot.

This species appears to lack any close allies.

Cuzco: Prov. of Paucartambo, Sta. Isabel, Kosñipata, at 1800 meters altitude, January 4–5, 1946, *C. Vargas 5533* (Type in Herb. Ames No. 65927).

Maxillaria fasciculata *C. Schweinfurth sp. nov.*

Herba epiphytica, vagans. Caulis gracilis, teres, remote pseudobulbifer. Pseudobulbi anguste ellipsoidei, unifoliati, basi vaginis pluribus distichis imbricatis celati. Folia in vivo valde carnosa, linearia, plusminusve conduplicata, apice subacuta vel rotundata. Flores e vaginarum

axillis exorientes, perparvi, cum sepalis recurvis. Sepalum dorsale lanceolato-oblongum, acutum. Sepala lateralia oblongo-lanceolata, acuta, cum basi saccata obliqua. Petala elliptico-oblonga, basi apiceque obliqua. Labellum recurvum, prope medium trilobatum; lobi laterales comparate parvi, dentiformes, incurvi; lobus medius multo major, subquadratus, apice bilobatus. Columna gracilis, in pedem longum producta.

Plant epiphytic, sprawling, only a portion present. Stem slender, terete, arcuate, consisting of distinct segments separated by pseudobulbs, each one about 5.5 cm. long with about six or seven internodes that were concealed by evanescent sheaths and bearing at their extremities a few fibrous glabrous roots. Pseudobulbs narrowly ellipsoid, complanate-subtetragonous in section, unifoliate at the apex, concealed below by about two pairs of distichous, imbricating, evanescent leaf-bearing sheaths. From the axil of an inner sheath at the base of the pseudobulb emerges a young shoot up to about 3.5 cm. high which is gradually dilated upward and concealed by several close, imbricating, conduplicate sheaths of which the upper ones are leaf-bearing. Leaves very fleshy in the living plant, linear, more or less conduplicate (especially below), subacute to rounded at the more or less unequally bilobed apex, up to 9.3 cm. long and 1 cm. wide when expanded. Flowers very small, apparently emerging in pairs from the axils of the sheaths on the young shoots, with the sepals and the anterior half of the lip recurved in natural position. Sepals and petals membranaceous. Dorsal sepal lanceolate-oblong, acute, about 5.5 mm. long and 1.5 mm. wide. Lateral sepals oblong-lanceolate, with a very oblique saccate and dilated base, about 6 mm. long measured along the posterior margin and 2 mm. wide near the base. Petals elliptic-oblong, somewhat oblique at the base and near the subacute

apex, about 5.4 mm. long and 2 mm. wide. Lip strongly arcuate-recurved with the lower half erect and parallel to the column in natural position, sharply 3-lobed near the middle, nearly 7.2 mm. long when expanded; lateral lobes relatively very small, triangular-dentiform, obtuse or acute, incurved; mid-lobe much larger, subquadrate, bilobed in front; disc much thickened below, the thickening developed into a transverse lobulate callus between the lateral lobes. Column rather slender, dilated above, about 3 mm. high at the back, produced into a subequally long foot.

This species is allied to *Maxillaria purpurea* (Spreng.) Ames & Correll, but differs markedly in the lip which lacks a claw and is bilobed in front.

Junín: Prov. of Tarma, Utcuyacu, *F. Woytkowski 21* (liquid material supplied by Univ. Calif. Bot. Gard. (Berkeley) culture no. 50.1844) (Type in Herb. Ames no. 66124 and in Ames liquid coll.).

Maxillaria spathulata *C. Schweinfurth sp. nov.*

Herba epiphytica, cum rhizomate elongato. Pseudobulbi distantes, complanato-ovoidei, unifoliati, basi vaginis duabus conduplicatis foliiferis utrinque circumdati. Folia variabilia, ovato-elliptica vel elliptico-oblonga vel lanceolata, acuta vel acuminata, sessilia. Flores parvi, in vaginarum axillis, subcarnosi. Sepalum dorsale lanceolatum, acuminatum. Sepala lateralia oblique et anguste triangulari-lanceolata, basi cum columnae pede mentum breve formantia. Petala minora, oblanceolato-linearia. Labellum paulo infra medium acute trilobatum, expansum oblongo-spathulatum; lobi laterales parvi, erecti, porrecti; lobus medius multo major, rotundato-obovatus, leviter retusus; discus inter lobos laterales callo subquadrato retuso ornatus. Columna crassa, in pedem brevem producta.

Plant epiphytic, with an elongate rhizome bearing pseudobulbs at remote intervals. Segments of the rhizome

slender, straight, subterete, entirely concealed by close tubular imbricating sheaths, about 9–11 cm. long, joining at an obtuse angle beneath the pseudobulb where the rhizome is more or less branching. Pseudobulbs situated at the angles formed by the segments of the rhizome, complanate-ovoid, unifoliate at the apex, up to 2 cm. high, rugose-striate in the dried specimen, clothed at base by two pairs of imbricating conduplicate sheaths, the upper ones leaf-bearing. Leaves variable in size and shape, ovate-elliptic, lanceolate or elliptic-oblong, sharply acute or acuminate, sessile at the complicate base, up to 8.4 cm. long and 3.4 cm. wide. Flowers small, solitary in the axils of bracts surrounding the pseudobulbs, subsessile, reddish with a cream-colored lip. Sepals and petals subparallel, rather fleshy. Dorsal sepal lanceolate or oblong-lanceolate, acuminate, concave, about 10 mm. long and 3 mm. wide. Lateral sepals obliquely and narrowly triangular-lanceolate, shortly acuminate, about 10 mm. long on the posterior margin, forming with the column-foot a mentum about 4 mm. long. Petals oblanceolate-linear, acute, lightly concave above, about 8.9 mm. long and 1.8 mm. wide. Lip slightly shorter than the sepals, lightly recurved in natural position, sharply 3-lobed with the lateral lobes incurved to form a tubular-involute basal portion, oblong-spatulate when forcibly expanded, lightly retuse in front, about 9.5 mm. long in the middle and 6.1 mm. wide above; lateral lobes small, linear-oblong, with the short free apex porrect, ovate-oblong, obliquely rounded and obscurely denticulate at the apex and about 1.6 mm. long; mid-lobe much larger than the lateral lobes, round-obovate, cuneate below, broadly rounded above, retuse, with crenulate-erose margins, fleshy-thickened above in the middle, about 6.8 mm. long; disc thickened below, with the thickening terminating in a subquadrate retuse callus between the

free apices of the lateral lobes. Column short, stout, subcylindric, about 4 mm. high at the back, extended into a short stout concave foot.

This species is closely allied to *Maxillaria tafallae* (Reichb.f.) C. Schweinf., but differs in having larger flowers with sharper sepals and petals, and with a cuneate, not subcordate, base to the lip.

The specific epithet is in allusion to the shape of the lip.

Cuzco: Prov. of Paucartambo, between Sta. Isabel and Asunción, at 1800 meters altitude, January 4, 1946, *C. Vargas 5532* (Type in Herb. Ames No. 63310).

Maxillaria Woytkowskii *C. Schweinfurth sp. nov.*

Herba epiphytica, mediocris. Rhizoma abbreviatum ut videtur. Pseudobulbus breviter et crasse cylindricus vel oblongo-ovoideus, valde anceps, unifoliatus. Folium distincte petiolatum; lamina elliptico-oblonga, acuta, infra cuneata; petiolus gracilis. Inflorescentiae breves, vaginis laxis pluribus omnino obtectae. Flos pro genere mediocris. Sepalum dorsale oblongum, apice rotundatum sed mucronatum. Sepala lateralia lanceolato-oblonga, obtusa sed mucronata, leviter obliqua. Petala oblongo-lanceolata vel elliptico-lanceolata, supra et infra angustata, acuta. Labellum tubulari-involutum, expansum in circuitu anguste ellipticum, supra medium leviter trilobatum cum lobo medio ovato-oblongo et multo incrassato; discus medio unicallosus.

Plant epiphytic, medium-sized. Rhizome apparently abbreviated. Roots fibrous, flexuous, glabrous, slender. Pseudobulb oblong-cylindric or oblong-ovoid, strongly ancipitous, unifoliate, about 2.5–3 cm. long, finely rugose in the dried plant, surrounded below by two pairs of imbricating concave sheaths which are scarious and non-leaf-bearing, the upper one being much larger. Leaf distinctly petioled; lamina elliptic-oblong, acute, cuneate

below, subcoriaceous, about 16.5 cm. long and 3.2 cm. wide, with the mid-nerve sulcate on the upper surface and carinate beneath; petiole rather slender, channelled, 2.7 cm. long. Inflorescences one or two, erect or spreading, much shorter than the leaf; peduncle slender, entirely or nearly concealed by six loose convolute scarious sheaths, about 7 cm. long; pedicellate ovary concealed and surpassed by a similar convolute sheath. Flower medium-sized for the genus, rigid-nervose. Dorsal sepal oblong, abruptly rounded but with a dorsal subapical mucro, lightly concave, about 2.1 cm. long and 8 mm. wide. Lateral sepals lanceolate-oblong, lightly oblique, obtuse but with a dorsal subapical mucro, about 2.3 cm. long measured along the posterior margin and 7.6 mm. wide at the base. Petals oblong-lanceolate or elliptic-lanceolate, narrowed above and below, acute, slightly oblique, about 1.9 cm. long and 5.4 mm. wide across the middle. Lip lightly recurved and tubular-involute in natural position, narrowly elliptic in outline when expanded, lightly 3-lobed above the middle, about 1.6 cm. long and 7.6 mm. wide across the middle when expanded; lateral lobes without free apex, rounded above; mid-lobe ovate-oblong, very fleshy, rounded at the apex, about 5.1 mm. long; disc with a fleshy band which is indistinct through the center of the lower half but gradually becomes more defined in the middle and forms an ovate-oblong obtuse fleshy callus. Column stout, arcuate, about 9.5 mm. long, with a minute erose-margined clinandrium, produced into a stout foot about 7 mm. long.

This species appears to have several more or less close allies. It differs from the Colombian *Maxillaria brunnea* Linden & Reichb.f. in its smaller leaves, dissimilar acute petals, as well as in the color of the flowers. It is distinguished from the Colombian *M. Shepheardii* Rolfe by its narrower leaves, dissimilar petals and shorter lip with

different lobing. It differs from the Bolivian *M. simaco-ana* Schltr. in having lanceolate, not linear, petals, and dissimilar lobes of the lip.

Junín: Prov. of Tarma, Vitoc, at 1400 meters altitude, "a most common, epiphytic species with a wide distribution in the region of Chanchamayo from ca. 900–1,400 m. a. s. level," leaves pale green with a bluish tint, sepals and petals white with a delicate yellow green hue, lip white with purple margins and a white tip, column with a pale pink tip and a deep purple orifice and base, December 1942, *F. Woytkowski 2* (Type in Herb. Ames No. 65455).

Trichopilia gracilis *C. Schweinfurth sp. nov.*

Herba epiphytica, mediocris. Rhizoma abbreviatum. Pseudobulbi numerosi, congesti, anguste cylindracei, unifoliati. Folium lineari-oblongum vel elliptico-oblongum, acutum, infra breviter angustatum. Inflorescentia basalis, suberecta, laxissime bi- vel triflora, quam folium brevior. Flos minor, campanulatus, albus. Sepala longitudinaliter concava, crassiora. Sepalum dorsale lineare vel lanceolato-lineare, acuminatum. Sepala lateralia libera, linearia vel lanceolato-linearia, leviter decurva, longe acuminata, quam sepalum dorsale angustiora. Petala lanceolato-linearia, leviter decurva, acuminata, sepalis paulo breviora. Labellum circa columnam infra convolutum, expansum oblongo-obovatum, apice late rotundatum, utrinque supra leviter contractum. Columna perbrevis, apice erecto denticulato.

Plant epiphytic, medium-sized for the genus, about 29.5 cm. or less high. Rhizome abbreviated. Roots fibrous, rather stout, glabrous. Pseudobulbs caespitose, numerous, narrowly cylindric, sometimes more or less arcuate, unifoliate at the apex, 5–11 cm. long and up to 9 mm. wide, striate-sulcate, concealed at the base by a few firm evanescent sheaths. Leaf linear-oblong to elliptic-oblong, acute, shortly narrowed below to a sessile or shortly petioled complicate or conduplicate base, subcoriaceous,

11.7–18 cm. long, 1.4–2.1 cm. wide, with the mid-nerve sulcate above and prominently exserted beneath. Inflorescence basal, suberect, very loosely 2- to 3-flowered above, shorter than the leaf or rarely (including the terminal flower) subequaling the leaf; peduncle slender, about 6.5–15 cm. long, with three close tubular separated sheaths; floral bracts closely clasping and much shorter than the pedicellate ovary, apparently ovate-oblong when expanded. Pedicellate ovary up to 4.5 cm. long. Flowers rather small for the genus, campanulate, white with orange on the throat of the lip. Sepals rather fleshy, longitudinally concave. Dorsal sepal linear or lanceolate-linear, acuminate, 5- or 6-nerved, about 2.6–3.2 cm. long and 4 mm. wide when expanded. Lateral sepals free, obliquely linear or lanceolate-linear, lightly decurved, long-acuminate with a conduplicate apex, 3- to 5-nerved, about 2.6–3.3 cm. long and 3 mm. wide when expanded. Petals obliquely lanceolate-linear, more or less lightly decurved, acuminate with a subconduplicate apex, 3-nerved (5-nerved near the base), about 2.5–3.1 cm. long and 3.5–4 mm. wide. Lip slightly shorter than the sepals with the lower portion convolute around the column in natural position, oblong-obovate, broadly rounded in front, lightly contracted on each side above the middle, cuneate below, with the central line below adnate to the lower half of the column, about 2.5–2.8 cm. long and 1.6–1.8 cm. wide near the apex when expanded; disc with a short more or less distinct fleshy keel below the middle. Column short, stout, slightly dilated upward, terminating in an upright somewhat bilobed denticulate clinandrium, about 9 mm. high at the back.

This species is allied to *Trichopilia juninensis* C. Schweinf., but differs in having smaller flowers, free lateral sepals and a simple lip which lacks the lateral keels

of that species. It differs from *T. fragrans* (Lindl.) Reichb.f. in having much narrower pseudobulbs and leaves and smaller flowers with a simple lip.

JUNÍN: Prov. of Tarma, Agua Dulce, at 1800 meters altitude, epiphyte in forest, pseudobulbs, leaves and peduncle dark green, March 15, 1948, *F. Woytkowski 35473* (TYPE in Herb. Univ. Calif.; ISOTYPE in Herb. Ames No. 65449); same locality, at 1900 meters altitude, epiphyte in shady forest, mid-nerve of leaf yellowish, lip with seven orange spots in the center, March 8, 1948, *F. Woytkowski 35428*.

EXPLANATION OF THE ILLUSTRATION

PLATE XLI. EPIDENDRUM BREVIRACEMUM *C. Schweinfurth*. 1, plant, natural size. 2, lateral sepal, three times natural size. 3, dorsal sepal, three times natural size. 4, petal, three times natural size. 5, column and lip, three times natural size.

Drawn by DOROTHY H. MARSH

Plate XLI

EXPLANATION OF THE ILLUSTRATION

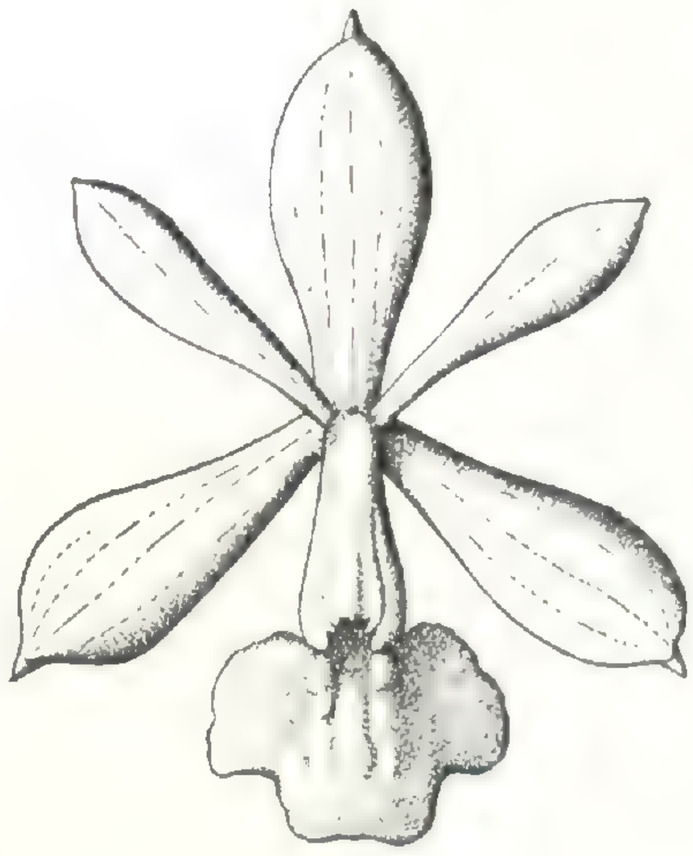
PLATE XLII. EPIDENDRUM CRASSUM *C. Schweinfurth*. 1, plant, one half natural size. 2, flower, expanded, two and one half times natural size. 3, column and lip, from side, four times natural size.

Drawn by DOROTHY H. MARSH

Plate XLII

1

3



2

D.H.M.

EPIDENDRUM
crassum
C. Schweinf.

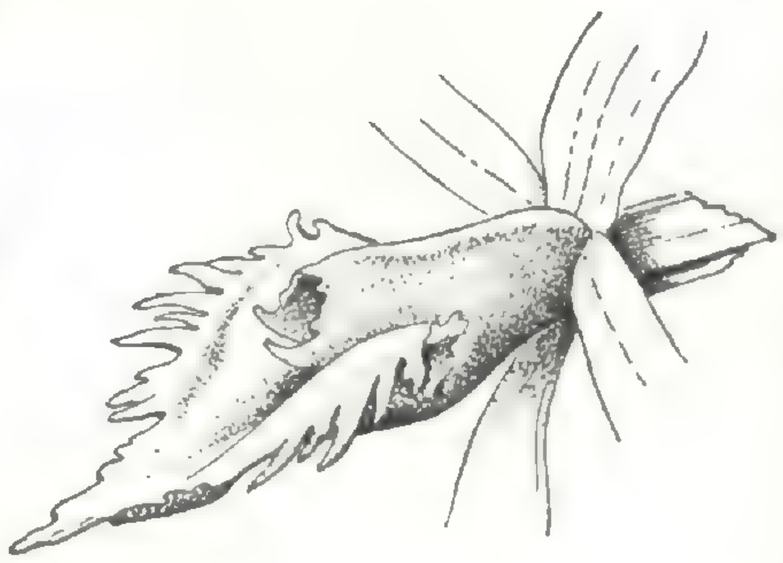
EXPLANATION OF THE ILLUSTRATION

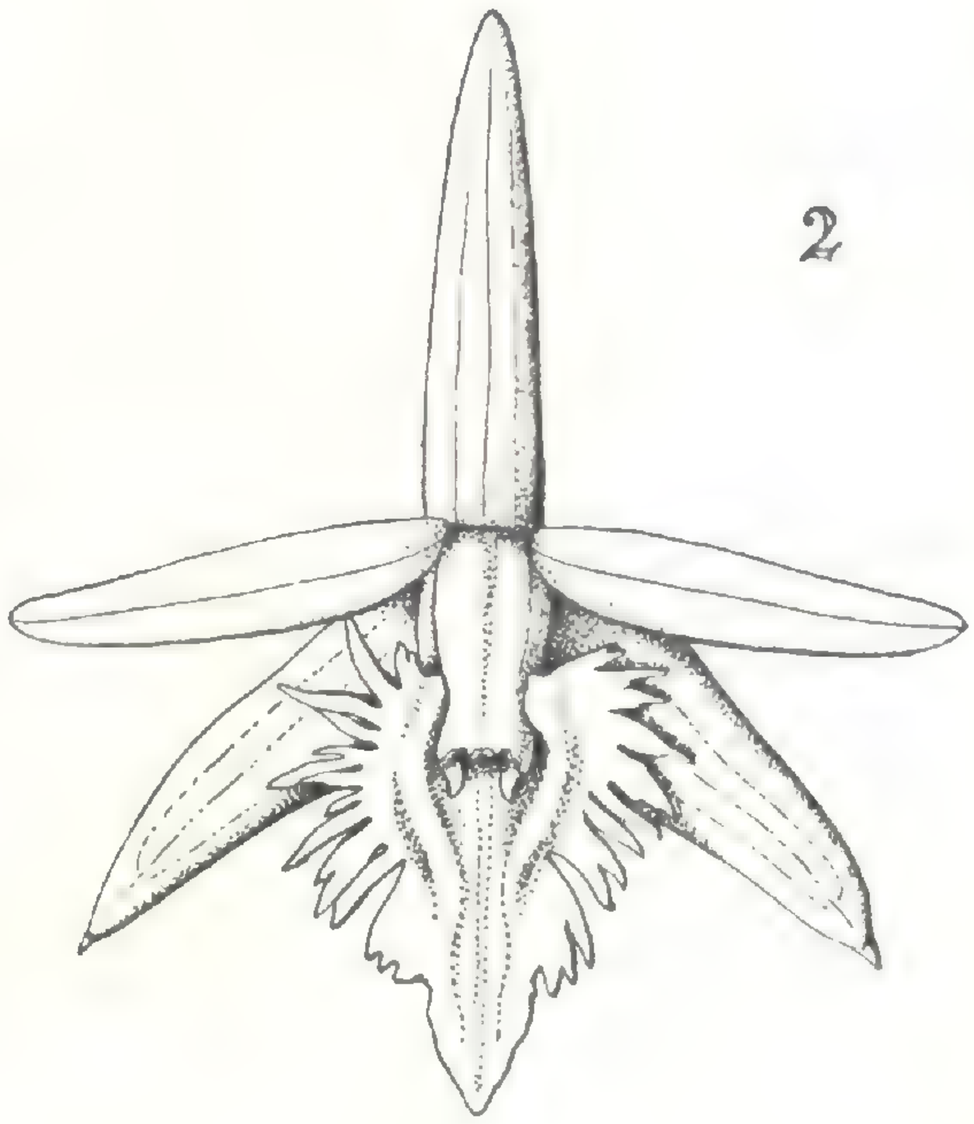
PLATE XLIII. EPIDENDRUM LACERATUM *C. Schweinfurth*. 1, plant, twice natural size. 2, flower, expanded, five times natural size. 3, column and lip, three quarters view, five times natural size.

Drawn by DOROTHY H. MARSH

EPIDENDRUM *laceratum*

C. Schweinfurth





DHM.

EXPLANATION OF THE ILLUSTRATION

PLATE XLIV. EPIDENDRUM SUBLIBERUM *C. Schweinfurth.* 1, plant, about seven eighths natural size. 2, flower, natural position, five times natural size. 3, lip, expanded, five times natural size. 4, lip and column, from side, five times natural size. 5, lateral sepal, five times natural size. 6, petal, five times natural size. 7, dorsal sepal, five times natural size.

Drawn by DOROTHY H. MARSH

EPIDENDRUM *subliberum* C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

PLATE XLV. EPIDENDRUM TENUISPATHUM *C. Schweinfurth*. 1, plant, one half natural size. 2, flower, expanded, natural size. 3, column and lip, three quarters view, natural size. 4, lateral sepal, natural size.

Drawn by DOROTHY H. MARSH

Plate XLV

EXPLANATION OF THE ILLUSTRATION

PLATE XLVI. ORLEANESIA PERUVIANA *C. Schweinfurth*. 1, plant, one half natural size. 2, flower (without lip), three quarters view, five times natural size. 3, petal, four times natural size. 4, dorsal sepal, four times natural size. 5, lateral sepal, four times natural size. 6, lip, three times natural size.

Drawn by DOROTHY H. MARSH

Plate XLVI

ORLEANESIA
peruviana

C. Schweinf.

D.H.M.

EXPLANATION OF THE ILLUSTRATION

PLATE XLVII. VARGASIELLA PERUVIANA *C. Schweinfurth*. 1, plants, one fourth natural size. 2, flower, from side, one and one half times natural size. 3, dorsal sepal, twice natural size. 4, petal, twice natural size. 5, lip, expanded, from above, twice natural size. 6, column and lip, from side, twice natural size. 7, anther with pollinia, from below, eight times natural size.

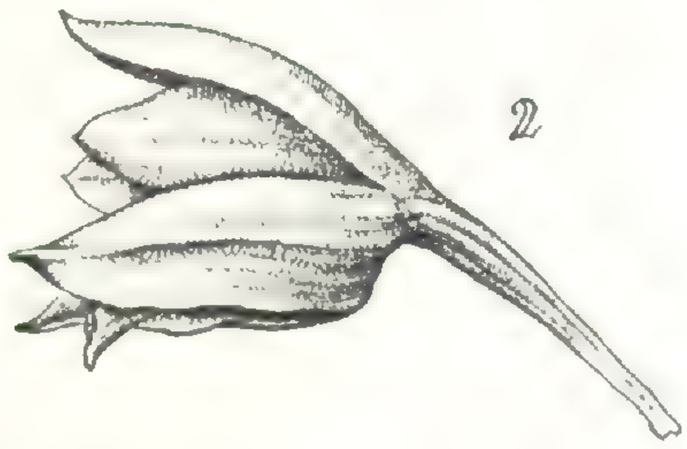
Drawn by ELMER W. SMITH

VARGASIELLA

peruviana

C. Schweinf.

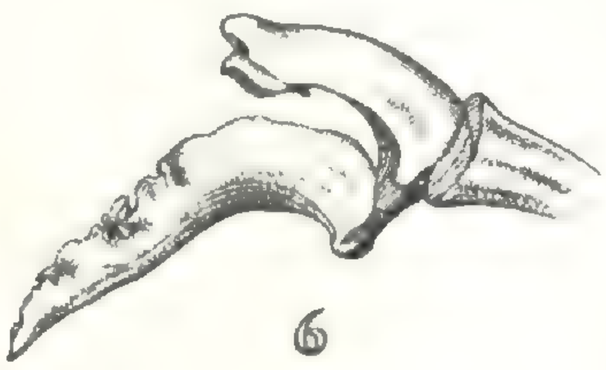
3



2

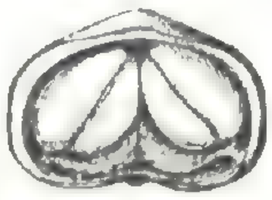
5

4



6

1



7

E. W. Smith

EXPLANATION OF THE ILLUSTRATION

PLATE XLVIII. BUESIELLA PUSILLA *C. Schweinfurth.*
1, plants, two thirds natural size. 2, flower-bud, from side, eight times natural size. 3, flower, partially expanded, from side, six times natural size. 4, petal, six times natural size. 5, lip, expanded, twelve times natural size. 6, anther with pollinia, from below, twenty times natural size.

Drawn by ELMER W. SMITH

BUESIELLA *pusilla*

C. Schweinfurth

E. W. Smith

EXPLANATION OF THE ILLUSTRATION

PLATE XLIX. XYLOBIUM LATILABIUM *C. Schweinfurth.* 1, plant, one half natural size. 2, inflorescence, one half natural size. 3, flower, expanded, natural size.

Drawn by DOROTHY H. MARSH

XYLOBIUM *latilabium C. Schweinf.*

2

1

3

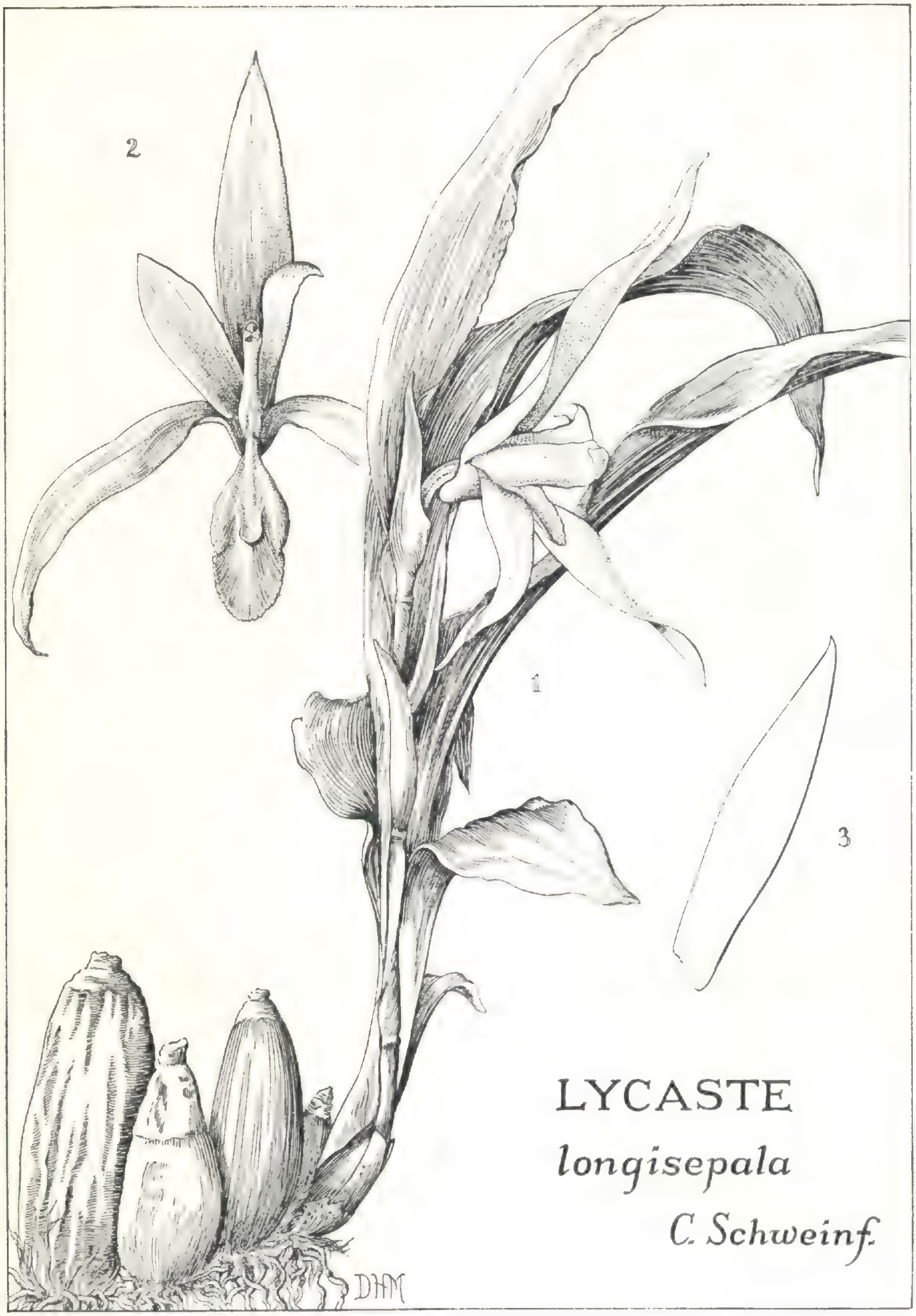
DHM

EXPLANATION OF THE ILLUSTRATION

PLATE L. LYCASTE LONGISEPALA *C. Schweinfurth.*
1, plant, two fifths natural size. 2, flower, partially expanded, one half natural size. 3, lateral sepal, expanded, one half natural size.

Drawn by DOROTHY H. MARSH

Plate L



LYCASTE

longisepala

C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

PLATE LI. ZYGOPETALUM KLUGII *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, expanded, natural size. 3, column and lip, from side, natural size.

Drawn by DOROTHY H. MARSH

ZYGOPETALUM Klugii
C. Schweinf.
1
3
DHM.

EXPLANATION OF THE ILLUSTRATION

PLATE LII. MAXILLARIA ANGUSTIBULBOSA *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, expanded, natural size.

Drawn by DOROTHY H. MARSH

Plate LII

MAXILLARIA
angustibulbosa
C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

PLATE LIII. MAXILLARIA FASCICULATA *C. Schweinfurth.* 1, plant, seven eighths natural size. 2, lateral sepal, five times natural size. 3, petal, five times natural size. 4, dorsal sepal, five times natural size. 5, column and lip, three quarters view, five times natural size. 6, flower, natural position, five times natural size.

Drawn by DOROTHY H. MARSH

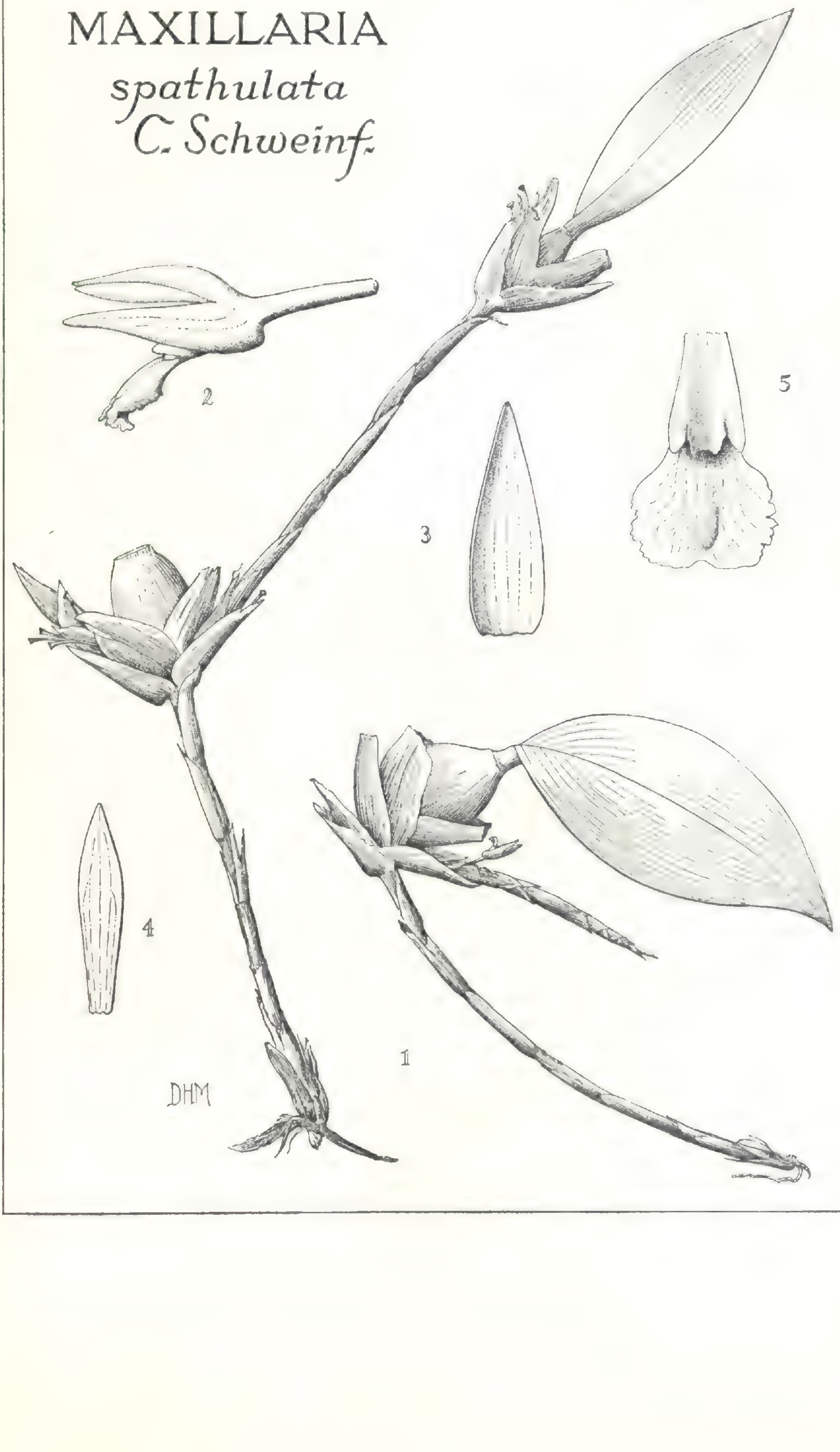
PLATE LIII

EXPLANATION OF THE ILLUSTRATION

PLATE LIV. MAXILLARIA SPATHULATA *C. Schweinfurth*. 1, plants, five eighths natural size. 2, flower, from side, twice natural size. 3, dorsal sepal, three times natural size. 4, petal, three times natural size. 5, lip, expanded, three times natural size.

Drawn by DOROTHY H. MARSH

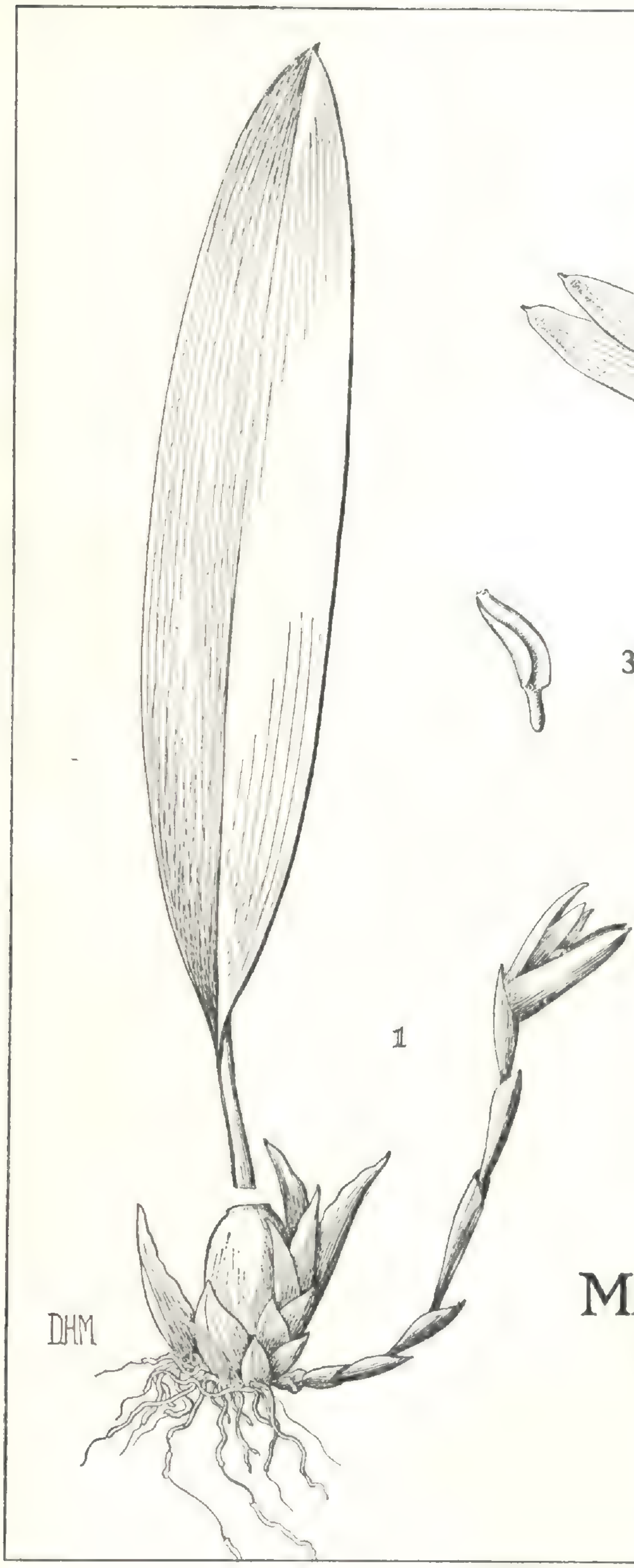
MAXILLARIA
spathulata
C. Schweinf.



EXPLANATION OF THE ILLUSTRATION

PLATE LV. MAXILLARIA WOYTKOWSKII *C. Schweinfurth*. 1, plant, five eighths natural size. 2, flower, expanded (without lip), natural size. 3, lip, three quarters view, natural size. 4, lip, expanded, twice natural size.

Drawn by DOROTHY H. MARSH



MAXILLARIA

Woytkowskii

C. Schweinf.

EXPLANATION OF THE ILLUSTRATION

PLATE LVI. TRICHOPILIA GRACILIS *C. Schweinfurth.* 1, plant, one half natural size. 2, flower, expanded, natural size. 3, lip and column, from side, natural size.

Drawn by DOROTHY H. MARSH

TRICHOPILIA *gracilis* C. Schweinf.

BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MARCH 12, 1952 VOL. 15, NO. 6

THE PRE-COLUMBIAN OCCURRENCE OF LAGENARIA SEEDS IN COASTAL PERU

BY

MARGARET ASHLEY TOWLE

IN the light of the recent discussion by Dr. Thomas W. Whitaker (Whitaker & Bird, 1949) of the seeds of gourds (*Lagenaria siceraria*) recovered at Huaca Prieta on the coast of Peru, the results of a study of gourd seeds found at four other archaeological sites on this coast are of special interest.

The site of Huaca Prieta is located on the north coast of Peru not far from the mouth of the Chicama River. It consists of a large midden and a smaller midden slightly to the north of the larger. Both of these were examined by Mr. Junius B. Bird in 1946–47 and described by him in his preliminary reports (Bird, 1948). The exploration of the site proved that the larger mound and the lower levels of the smaller mound represent an early primitive culture which Bird designates as "Early Farmers" or "Preceramic agriculture." The time limits of this horizon are approximately 3000–1200 B.C. according to radiocarbon dating (Bird, 1951). The economy of these people was based partly upon fishing, and partly upon agriculture. Although remains of maize were lacking, specimens of a number of other plants were recovered. Some of these, such as the cat-tail, were native to the area and grew wild, while others, like the cucurbits, in all probability were cultivated.

A later culture known as Cupisnique appeared in the upper levels of the smaller midden. An early type of pottery and small cobs of maize were among the cultural innovations found in these levels. This evidence suggests that a group of people had migrated into the area from another region.

One of the plants most frequently found in both the Preceramic and Cupisnique levels was the common gourd, *Lagenaria siceraria*. Its occurrence was more marked in the older period, the recovered specimens consisting of gourd artifacts, shell fragments, pedunceles and seeds. These categories were also represented in the later period, but the specimens, though still abundant, were fewer in number. Selected samples of the cucurbit materials recovered by Bird were submitted to Whitaker for study. These samples consisted of specimens of both Lagenaria and Cucurbita and are described in his report.

From the specimens found in the lower or Preceramic levels, Whitaker isolated two types of Lagenaria seeds. One type was disassociated from the fruits; the other was still contained in a bottle gourd that had been used as a net float. The first group of seeds is characterized by large size, parallel longitudinal lines and the presence of a winged protuberance at either side of the broad end of the seed. The measurements of these large seeds are not given, but a fair approximation may be obtained by comparison with the mm. scale at the bottom of the photograph in which the seeds are pictured (Whitaker & Bird, 1949, fig. 3 D). The average maximum length of the six specimens shown is 17 mm.; the average maximum width 9 mm. Whitaker states that these large, broad seeds with their paired winged protuberances are similar to modern Lagenaria seeds from the Old World. Furthermore, he notes that they are in marked contrast to the typical gourd seeds found in other archaeological collec-

tions from South America which are said to be smaller in size, slender and often lacking the paired winged protuberances.

This smaller type was represented in the lower levels at Huaca Prieta by seeds recovered from a net float and illustrated by Whitaker (loc. cit., fig. 3 C). These seeds have an average maximum length of 13 mm.; an average maximum width of 6 mm.; in two cases they appear to have a suggestion of a winged protuberance. In addition to this group of specimens, others of the same type were recovered from the later or Cupisnique levels.

To summarize the occurrence of these two types of Lagenaria seeds at Huaca Prieta: the first or large, broad type appeared only in the Preceramic horizon; the second or small type was recovered in both the Preceramic and the Cupisnique levels.

Through the generosity of Dr. William Duncan Strong of Columbia University I have been privileged to study the ethnobotanical collections from several other archaeological sites on the coast of Peru. I wish also to express at this time my appreciation to various members of the Botanical Museum and the staff of the Biological Laboratories of Harvard University for their generous advice and assistance given me during the course of this study.

Among the plant remains in these Peruvian collections are seeds, peduncles and shells, both whole and broken, of *Lagenaria siceraria*. Descriptions of the seeds of this plant from four sites will be given below. However, it seems advisable at the outset to describe briefly the general structure of Lagenaria seeds.

The seeds of Lagenaria vary in shape and general appearance, depending upon the type of fruit; they are usually more or less tapering. The hilum, the point of attachment of the seed to the fruit, is at the narrower end. The seed coat or testa comprises three types of tis-

sue. The outer layer or epidermis consists of long, slender, parallel cells. These cells are easily damaged and only a few scattered broken cells of this layer may be found. The cells that constitute the second portion of the testa form a soft, spongy layer. The ones that comprise the inner part are more compact and furnish a hard, firm protective layer for the embryo.

Among the external characteristics that Lagenaria seeds may possess are longitudinal ridges, and paired winged protuberances at either side of the end of the seed opposite the hilum. These are surface outgrowths of the testa and are formed of the cell tissue of the outer layers of the seed coat. Because of the spongy nature of this tissue these structures may disappear in time through erosion, as may part of the outer layer itself, leaving merely a narrow strip of spongy tissue or possibly only the hard inner layer of the testa.

The archaeological sites from which the Lagenaria seeds were obtained are Aspero, Huaca de la Cruez, Pachacamac and Castillo de Tomaval. Two of these sites, Aspero and Pachacamac, are located on the central coast of Peru. The other two, Huaca de la Cruez and Castillo de Tomaval, are located in the Viru Valley on the north coast of Peru south of the site of Huaca Prieta.

The Aspero site is located near Puerto de Supe. It was excavated by Strong and Willey in 1941 42 (Strong, 1943). Among the plant remains recovered is a whole oblong gourd (747/41A), with the wall crushed at one point. This presumably occurred after it was placed in the burial in which it was found. The gourd contained 288 seeds some of which were still attached to the shell wall when examined. All of these seeds show evidence of erosion, although in varying degrees. Samples of groups of these seeds based upon the degree of erosion are shown in Plate LVII.

Of the 288 seeds, 117, or approximately 40 percent, are well preserved (Plate LVII, A). The outer surface of the specimens is only slightly eroded and the parallel longitudinal lines and paired winged protuberances are clearly seen. The average maximum length is 14 mm.: the average maximum width 8 mm. These seeds are a light brown color. There are 137 seeds, approximately 48 percent of the total, which show intermediate degrees of erosion (Plate LVII, B). All of the specimens in this group show a marked degree of erosion, in some cases the wings of the seeds having completely disappeared. However, the parallel lines and the ridge on the edge of the seed can still be detected. Finally, there is a third group of seeds which shows the greatest evidence of erosion with neither parallel lines nor wings remaining (Plate LVII, C). There are 34 seeds, or 12 percent of the total, in this group. The average maximum length of these specimens is 14 mm.; the average maximum width 7 mm. The similarity between the average maximum length of the best and most poorly preserved seeds can be explained by the fact that in both groups the characteristic points at the center of either end of the seed are part of the harder inner layer of the seed coat. They are thus more resistant to erosion than those parts of the testa that comprise the softer outer layer. In these two groups of specimens these points were used in the majority of cases in obtaining the maximum seed length, since the wings did not extend below the point at the center of the broad end of the seed.

The well preserved seeds of this gourd from Aspero resemble the large, broad, winged seeds from the Preceramic levels at Huaca Prieta described by Whitaker, although their average maximum measurements lie between the measurements of his two categories. The slender, eroded seeds from the same gourd might easily be

mistaken for seeds of the second or smaller type found at Huaca Prieta, as a comparison of Plate LVII, C with Whitaker's fig. 3C clearly reveals. Yet the variation in the seeds of the Aspero gourd, all contained in a single fruit, is strictly the product of differences in the degree of erosion.

The early Ancon-Supe period of the central coast, to which the Aspero site belongs, is contemporaneous with the Cupisnique period of the north coast. Although the large, winged gourd seeds were not recovered from the Cupisnique levels at Huaca Prieta, gourd plants producing seeds of this kind were existing at that time at Aspero to the south.

At Huaca de la Cruez in the Viru Valley Strong discovered 88 seeds (3/V-162) and some shell fragments of Lagenaria in a burial of the Mochica period. The seeds were together in one lot. Although not actually associated in the collection with the parent fruit, which in all probability became broken after burial, the shell fragments and seeds may have been parts of a single fruit.

All of these seeds from Huaca de la Cruez show evidence of erosion. Seventeen specimens, or 27 percent of the entire group, are fairly well preserved; 37 specimens, or 45 percent, show marked erosion; while 27 seeds, or 33 percent, have lost practically all of the outer layer of the seed coat. A series of these specimens showing progressive degrees of erosion are illustrated in Plate LVIII.

The seventeen best preserved specimens (Plate LVIII, A) have an average maximum length of 18 mm. and an average maximum width of 10–10.5 mm. The parallel longitudinal lines and the paired wings are distinct. The color of the seeds is generally a light brown. A few, however, have an occasional black marking due to discoloration from the grave content.

The 27 specimens showing the greatest degree of ero-

sion (Plate LVIII, C) have lost the parallel lines and the paired protuberances. A thin layer of the softer outer surface of the testa alone remains. These seeds have an average maximum length of 16 mm. and an average maximum width of 8 mm. Compared to the measurements of the best preserved group of seeds, they are 2 mm. shorter in the average maximum length and 1.5 2 mm. narrower in the average maximum width. The color of this group of seeds is either black or brown mottled with black. Attached to the surface of several seeds are fragments of carbonized material. These seeds, like those from Aspero, could, if found separately from the better preserved ones, be classified as belonging to the slender type of Lagenaria seed found at Huaca Prieta. However, when the entire series is considered, all the Lagenaria seeds found at Huaca de la Cruez, as at Aspero, must be referred to the large, broad type found in Preceramic levels at Huaca Prieta.

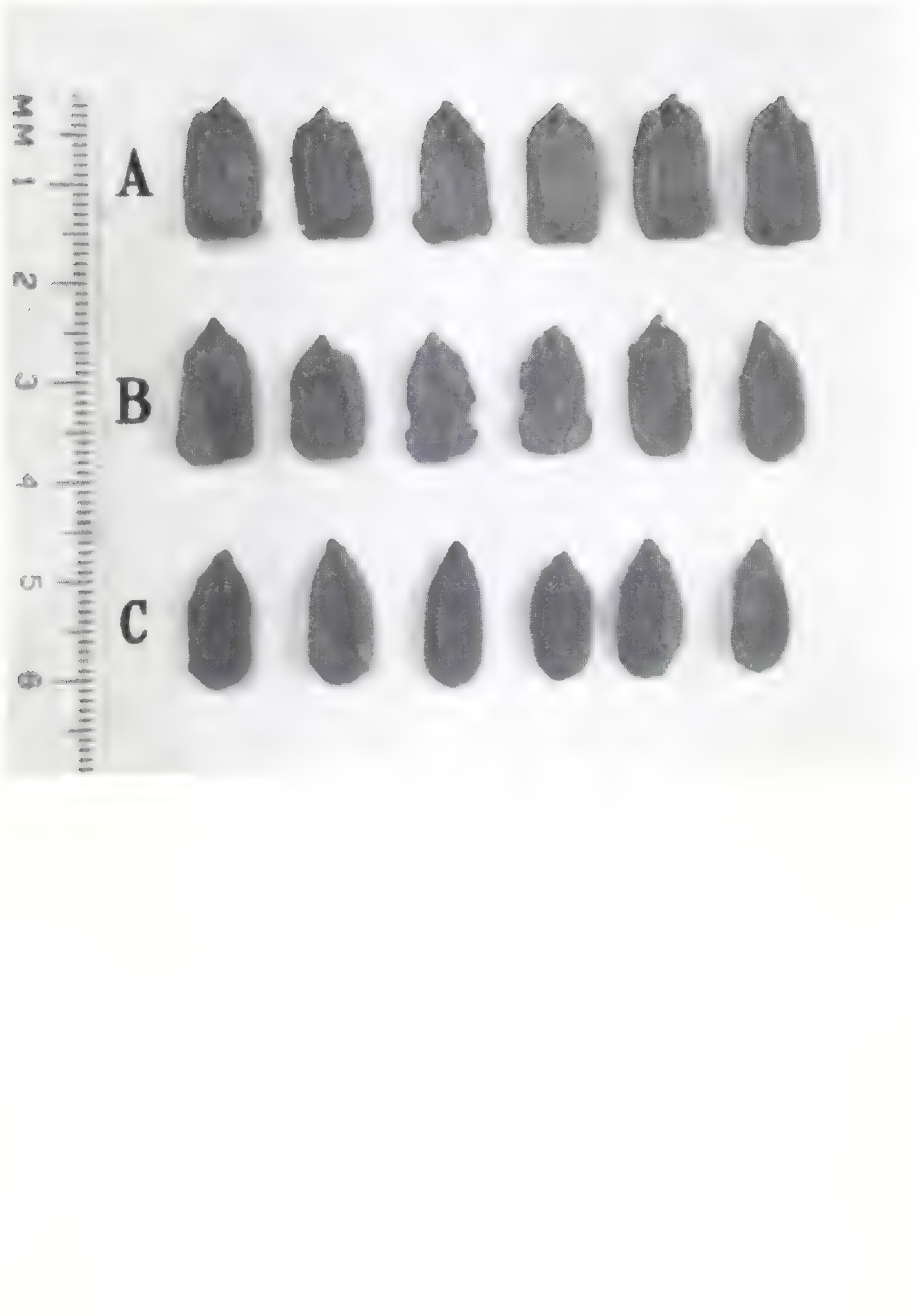
A second site on the central coast in which seeds of Lagenaria were recovered is Pachacamac. This large and important site lies in the Lurin Valley 30 kilometers from the present city of Lima. The extensive area covered by the ruins of the ancient city of Pachacamac includes the remains of the Temple of the Sun and the Temple of Pachacamac. This site has been the object of much exploration and study, one of the most recent of which has been the excavations of Strong, Willey and Corbet in 1942 (Strong, 1943). They concentrated the major portion of their work upon the large midden to the south of the main entrance to the Temple of the Sun. Two cuts were made from the outer edge of the debris to the temple wall, in an endeavor to study whatever cultural sequence existed.

Among the wide variety of plant remains recovered were numerous specimens of Lagenaria. There were two

EXPLANATION OF THE ILLUSTRATION

PLATE LVII. Seeds of Lagenaria from a single gourd recovered at Aspero showing varying degrees of erosion. A, best preserved. B, intermediate. C, most poorly preserved.

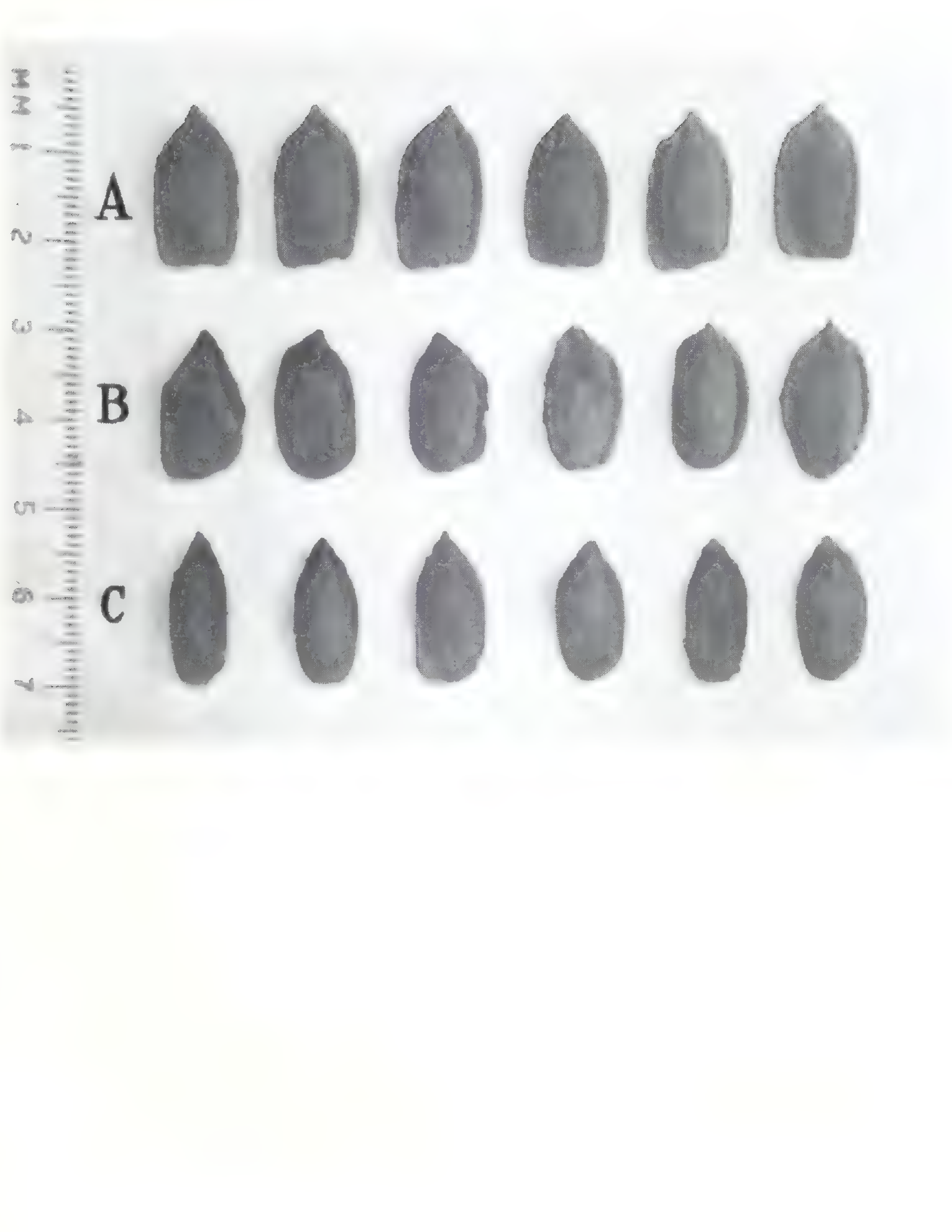
Plate LVII



EXPLANATION OF THE ILLUSTRATION

PLATE LVIII. Seeds of Lagenaria from a burial at Huaca de la Cruez showing the effect of erosion. A, well preserved. B, showing marked weathering. C, strongly eroded.

Plate LVIII



EXPLANATION OF THE ILLUSTRATION

PLATE LIX. Lagenaria seeds recovered from Castillo de Tomaval and Pachacamac. A, eroded seed of *Lagenaria siceraria* recovered from Castillo de Tomaval. B, two seeds from specimen 135/41A from Pachacamac. C, group of seeds from specimen G 81 from Pachacamac.

Plate LIX

shell fragments of this fruit to which seeds still clung along the inner shell wall. One specimen (135/41A) accompanied by two seeds (Plate LIX, B) comprises the flower end of a gourd fruit. The average maximum length of these seeds is 14 mm.; the average maximum width 7.5 mm. Both show some erosion of the outer seed coat, but the longitudinal lines and the paired wings are still distinct. One of the seeds is a cream color; the other a dark brown. This gourd shell was removed from a stratum showing Inca influence.

The stem end of another Lagenaria fruit (G 81) was recovered from the general digging in this refuse heap. Ten seeds were attached to the inner shell wall. These have an average maximum length of 14 mm.; and an average maximum width of 8 mm. All of these seeds retain the outer layer of the seed coat, although in a few specimens the parallel lines and paired wings have been partially worn away. Six of the seeds are a deep cream color while four are dark brown. A series of these seeds is shown in Plate LIX, C. It is not possible to give the exact cultural period to which this material belongs, since it came from the general digging. However, judging from the distribution of specimens of pottery found in this portion of the midden, it is reasonable to assume that it belonged to either an Inca-associated or Inca level.

The remaining site, Castillo de Tomaval, is in the Viru Valley on the north coast of Peru. Only one seed (21/V-51) of Lagenaria occurred in the collection of gourd remains from this site. This is a small, worn, partly-broken seed (Plate LIX, A) with a maximum length of 11 mm. and a maximum width of 7 mm. The outer layer of the seed coat is represented merely by a thin, uneven layer of spongy tissue with only a suggestion of the parallel longitudinal lines. The point at the center of the broad end of the seed is distinct, but only

a slight thickening of the outer layer of the testa suggests the former presence of wings. It seems reasonable to assign this eroded seed, as well as similar specimens from the other sites described, to the broad, winged type described by Whitaker. The site of Castillo de Tomaval is essentially of the Gallinazo period which follows the Cupisnique and the earlier Preceramic horizons.

In addition to the Lagenaria seeds described above, there are references in the ethnobotanical literature of prehistoric Peru to the occurrence of seeds of this plant in still other archaeological sites. Wittmack (1880–1887) identifies a gourd seed among the plant remains from Ancon on the central coast, and he gives an illustration (Taf. 107, fig. 17). Also, Costantin et Bois (1910, fig. 12) picture a seed recovered from another site on the central coast of Peru. Both of these seeds belong to the broad, winged type recovered at Huaca Prieta. Harms (1920) found fragments of gourd shells and seeds in the mummy wrappings from Ancon, but he neither illustrates nor describes this material. Carter (1945), in his study of certain archaeological cucurbit seeds from Peru, mentions the presence of 25 seeds of Lagenaria from Chincha on the south coast and attributes them to the late Inca period, c. 1300–1500 A.D. He gives their size as "17x7x3: 15x7x3" and further states that: "These are dark brown seeds with light longitudinal stripes and are of the characteristic Lagenaria size and shape." In the absence of illustrations or any mention of winged protuberances in the descriptions of the seeds recovered by Harms or those studied by Carter, one can not say definitely to which type of Lagenaria seed they belong, although on the basis of the few descriptive remarks that are given, one leans toward classifying both groups as of the broad, winged type of Lagenaria seed.

As a result of the present study of Lagenaria seeds in

collections of archaeological materials from Peru, it is evident that the seed type characterized by large size, the presence of longitudinal parallel lines and winged protuberances is the only type which occurs, and it is widely distributed in both time and space on the coast of Peru. Beginning on the north coast at Huaca Prieta it appears in Preceramic levels; at Castillo de Tomaval in the later Gallinazo period; and at Huaca de la Cruez in the much later Mochica period. Farther south on the central coast this seed type appears in the early Ancon-Supe levels at Aspero; and the later Inca-associated and Inca levels at Pachacamac. Although the cultural levels in which the seeds mentioned by Wittmack, Harms, and Costantin et Bois are not given, the age of the sites in which they were recovered makes it safe to attribute them to a late period. In other words, we have evidence that the large-seeded type of Lagenaria was in use in varying times from Preceramic through the Inca periods on the coast of Peru from Huaca Prieta on the north to Pachacamac and possibly Chincha on the south. Though one also suspects that some of the numerous gourd fruits recovered from sites further south produced this same broad type of seed, it is not possible to state definitely its presence there until descriptions and illustrations of material appear in the literature.

It is interesting to note that this large-seeded type of Lagenaria is unquestionably similar to seeds of gourds grown at the present time on the Peruvian coast. Through the kindness of Mr. Junius B. Bird, I have been able to examine modern Lagenaria seeds from the Chicama Valley. One sample of seeds, obtained from a round, bowl-shaped gourd, belongs to the large-winged seed-type. The other sample consists of smaller seeds with less pronounced wings. These came from a long-necked gourd that resembles the fruit from which Whit-

aker obtained his smaller type. The differences existing between these two groups of modern gourd seeds are probably due merely to a correlation with the type of fruit.

It has long been an accepted fact that Lagenaria was a well established cultigen in Pre-Columbian America, and the recent finding of gourd seeds in the Preceramic levels at Huaca Prieta has now placed its actual presence in the Western Hemisphere at or before 1200 B.C. (Bird, 1951). The problem of the origin of any cultivated plant is a matter of considerable interest, particularly in the case of a species which must have come from another hemisphere. Lagenaria is of special interest in that it was one of the few cultivated plants which was undoubtedly common to the tropics of both hemispheres in Pre-Columbian times.

Archaeological, historical, and linguistic evidence suggest that Lagenaria has long been part of man's economy in the Old World. He not only used the young fruits for food, but at an early date learned that the mature fruits were impervious to water and other liquids and therefore were admirably suited for containers. This characteristic also made this fruit adaptable for floats, particularly among people whose culture was intimately associated with the sea.

Many authorities consider *Lagenaria*, a monotypic genus, to be indigenous to Africa. But even if that is the case, it must have reached India and eastern Asia at a very early date, and then spread to Malaya, the islands of the Pacific, and tropical areas of the Americas. The question as to how this dispersal was effected is naturally a matter of speculation. Carter (1950), in his discussion of the presence of Lagenaria in the New World, concludes that this plant probably was carried by man across the Pacific ocean to the Western Hemisphere at an early

date. Kelly (1951) states even more emphatically that the evidence of Lagenaria in the New World points to early contacts between the two hemispheres. Although such a Pre-Columbian diffusion is a possible explanation, it is not the only one. Both authors refer, to but tend to minimize, the possibility of Lagenaria having floated to the shores of the Americas. It is, therefore, of interest to review some of the evidence for such a possibility.

The fruits of Lagenaria, like those of other genera of the Cucurbitaceae, are structurally adapted to dispersal by water. Although there is no experimental evidence to show how long a well-seasoned Lagenaria fruit will remain afloat, the buoyancy of these fruits and the impervious nature of their shell walls make it highly probable that they could float for an indefinite period.

There are many references in the literature to the transference of fruits and seeds from one location to another by means of ocean currents. One often quoted example is the presence on the coast of Norway of cucurbitaceous fruits and seeds from the American tropics carried there by the Gulf Stream. Included among these have been bottle-gourds (Ridley, 1930, p. 294).

Guppy (1906, p. 570) tells of having observed "small calabashes and bottle-gourds" on the beaches and in the ocean off the coast of Fiji. He experimented with one of these and proved that it was still buoyant even after it had floated in sea water for two months, and that some of the seeds germinated when planted in soil. He identifies this fruit as probably one of the species of *Cucurbita* that produces hard-shelled fruits. This genus is closely related to *Lagenaria*.

Guppy further reports (loc. cit., p. 125) the presence of a small bottle-gourd in the Guayaquil River and on the adjacent sea beaches in Ecuador. He states that these fruits will float for many months and that the seeds

will then germinate when planted. He concludes from the evidence that he presents that "bottle-gourds containing sound seeds are dispersed far and wide by the currents" and that "the gourds themselves will float for probably a year or more."

The coconut is another plant generally agreed to have been in both the New and Old World in Pre-Columbian times. The fruit of this palm, although its construction is quite different from that of the bottle-gourd, is also well adapted for water dispersal. Indeed its pericarp is essentially a floating organ. There is substantial evidence that the coconut has been widely dispersed by means of the sea (Ridley, 1930, p. 322).

From actual tests conducted by Edmondson (1941), it was proved that the seed of the coconut remained viable after having floated for 110 days in the ocean. This author further states that, given favorable conditions, a conservative estimate of the distance a coconut fruit might travel in that length of time would be 3,000 miles. In a private communication to Bruman (1941, p. 239) he says that he is convinced that a coconut would survive a much longer period than four months, but probably not one of seven months.

A more recent experiment with coconuts was carried on in connection with the voyage of the Kon-Tiki. Half of the coconuts taken were placed in baskets on the deck, while the remainder were stored beneath the raft where they were constantly washed by sea water. The result of this experiment was that the submerged fruits lost their viability; the others remained viable. However, the conditions under which the submerged lot of coconuts were placed do not completely simulate natural water dispersal. A coconut fruit in the sea floats buoyantly and is only partially submerged beneath the surface.

Certainly the evidence for water dispersal for Lagen-

aria, as well as for the coconut, is considerable and should not be dismissed too lightly in favor of the arguments for cultural diffusion.

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A NEW ARISTOLOCHIA FROM AMAZONIAN COLOMBIA

BY

RICHARD EVANS SCHULTES[1]

The caatingas of the upper Rio Negro area of Brazil, Colombia and Venezuela are fascinating to the naturalist because of the curious adaptation of their flora to xerophytism and because of the extraordinary number of endemics and primitive species which they harbor.

It was Spruce who, a century ago, first investigated these formations. Notwithstanding the thoroughness of Spruce's work and the collections of a number of later botanists, the composition and history of the caatinga-flora is but little understood. Every expedition into the upper Rio Negro basin brings back novelties and rare plants. Some of these indicate phytogeographical relationships with the flora of the great Venezuelan-Guianan land-mass; others, like the new concept which is described below, appear to stand alone with no close allies amongst the known species of South America.

Aristolochia Amesiana *R. E. Schultes sp. nov.*

Frutex scandens, robustissimus. Caulis volubilis, elongatus, paulo ramosus; rami volubiles, teretes, striolati,

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cum cortice nunc nigro nunc fusco-cinereo, tenui, glabro levique. Folia exstipulata, magnopere coriacea, elliptica, apice breviter apiculata vel subacuminata, basi rotundata (numquam cordata), margine valde revoluta, 13–16 cm. longa, 6–8 cm. lata, robustius petiolata (petiolis fusco-nigris, plerumque 2–3 cm. longis), nervis lateralibus quattuor, supra vivo cyaneo-viridia et nitidissima (siccitate straminea), cum nervis non elevatis, superficie oculo armato minutissime tessellata, subtus vivo pallide viridia, cum nervis omnibus prominenter elevatis, subdense sed minute albido-tomentulosa. Flores in racemis brevissimis, congestis, paucifloris et axillaribus, usque ad 8 cm. longi, pedunculo glabro gracili, usque ad 2 cm. longo. Perianthii pars basalis valde ovoideo-dilatata, 18 mm. longa, 10–11 mm. in diametro, extus glabra vel glabrescens et flavo-brunnea vel pallide purpurea; tubus obconicus, purpureo-venosus, stramineus vel flavo-brunneus, usque ad 3 cm. longus, basi 4 mm. sed apice 20 mm. in diametro, intus purpureo-papillosus, in os parvum constrictus; limbus altero latere expansus, altero truncatus, membranaceus, intus atrosanguineus, extus basi purpureus et prope apicem fusco-viridis, ovalis, 42 mm. longus, 20 mm. latus, ecaudatus, apice usque ad 2 mm. incisus, vivo subeucullatus, omnino glaber. Columna genitalis 5 mm. longa, apice 2.5 mm. in diametro, breviter stipitata, per dimidium sex-divisa, lobis pseudostylinis acutis. Stamina sex in serie unica, columnae adnata, antheris linearibus, usque ad 2.2 mm. longis, longitudinaliter dehiscentibus. Fructus adhuc ignotus.

A very robust vine. Stem twining, elongate, little branched. Branches twining, terete, striolate; bark either black or brownish grey, thin, glabrous, smooth. Leaves without stipules, extremely coriaceous, elliptic, apically short-apiculate or subacuminate, basally rounded (never cordate), the margin strongly revolute, 13–16 cm. long,

6–8 cm. wide, lateral veins four, in life glossy and bluish green above (straw-colored when dried), the surface very minutely tessellate under a glass, nerves not elevated, in life paler green beneath with all nerves prominently elevated, rather densely but minutely whitish tomentulose. Petiole robust, brownish black, mostly 2–3 cm. long. Racemes very short, congested, few-flowered, axillary. Flowers up to 8 cm. long with glabrous, slender pedunc1es up to 2 cm. long. Basal portion of perianth strongly ovoid-dilated, 18 mm. long, 10–11 mm. in diameter, glabrous or glabrescent, yellowish brown or pale purple without; tube obconic, purple-veined, straw-colored or yellow-brown, up to 3 cm. long, basally 4 mm. but apically 20 mm. in diameter, constricted into a small mouth, distantly papillose within; one lip expanded only on one side, truncate on the other, membranaceous, dark blood-red within, but outside, purple at the base and brownish green near the apex, oval, 42 mm. long, 20 mm. wide, ecaudate, apically with a slit up to 2 mm. deep, subcucullate in life, glabrous. Column 5 mm. long, apex 2.5 mm. in diameter, short-stipitate, divided into six parts for half its length; the pseudo-styline lobes acute. Stamens six in a single whorl, adnate to the column; the anthers linear, up to 2.2 mm. long, longitudinally dehiscent. Fruit unknown.

COLOMBIA: Comisaría del Vaupés, Río Negro, San Felipe (El Castillo), below confluence of Ríos Guainía and Casiquiare. "Vine. Leaves thick. Flowers brownish red outside, tip greenish brown outside. In caatinga." December 12, 1947, *Richard Evans Schultes & Francisco López 9296*.

Aristolochia Amesiana does not appear to be closely related to any of the described species of this interesting genus. It is at once set off as distinct by the extremely thick-coriaceous texture of its leaves. In having leaves which are elliptic with a rounded (never even slightly

EXPLANATION OF THE ILLUSTRATION

PLATE LX. ARISTOLOCHIA AMESIANA *R. E. Schultes.*
Habit and flowers about three quarters natural size.
Drawn by BLANCHE AMES

Plate LX

ARISTOLOCHIA *Amesiana R.E.Schult.*

cordate) base, *Aristolochia Amesiana* is also sharply distinct from most other species, approaching, amongst the South American representatives, only *A. maxima* Jacquin from which it differs markedly in the texture of the leaves, structure of the inflorescence and in floral characters.

In the key to the subgeneric sections of *Aristolochia* which Hoehne has published (Flora Brasilica 15, pt. 2 (1942) 25), *Schultes & López 9296* traces out to his section *Exstipulatae* (devoid of pseudo-stipules), sub-section *Eunnilabiatae* (flowers unilabiate, or with the lip usually not surrounding the mouth of the tube but developed on one side alone). *Aristolochia Amesiana* does not approach any of the concepts included in these sections, resembling *A. disticha* Masters, a species known only from the Rio Tapajóz in Amazonian Brazil, in having an extremely abbreviated racemose inflorescence.

In addition to the extraordinarily coriaceous and basally rounded leaves, *Aristolochia Amesiana* exhibits several other characters which are either rare or unknown in the genus. The curious triangular indentation or incision at the apex of the lip is much deeper and more strongly marked than in any other known South American species, although a similar condition is seen in *Aristolochia Macbrideana* Standl., *A. Eggersii* Hoehne and *A. papillaris* Mast. The column of *Aristolochia Amesiana* is unusually short in relation to the length of the tube, a condition seen in few of the South American species. In life, the leaves have a blue or steel-green sheen which, so far as I have been able to ascertain, has not been reported for other species.

It is obvious that *Aristolochia Amesiana*, like all other plants of the caatingas of the upper Rio Negro, is highly adapted to xerophytic conditions. It climbs in the low, light, semi-open groves of *Hevea pauciflora* var. *coriacea*,

Didymopanax Spruceanum, *Retiniphyllum* spp., *Bombax humile* and bushy species of *Clusia*. Apparently it is a rare element of the caatingas, since only one flowering plant was located during a year's stay in the region, although at least five other vines in sterile condition were seen in the same caatinga at San Felipe where the type was found.

Of the 137 South American species of *Aristolochia* treated by Hoehne in his monograph (loc. cit.), thirty-nine are known from the Amazon basin, and a number of other species, which as yet have not been collected from this area, are suspected to occur there. *Aristolochia*, it is evident, is well represented in this part of the continent. It is curious that all of the botanical activity along the Rio Negro has turned up only four species—all of them endemic to the basin—in this area which is one of the richest in diversification of species of plants. A century ago Spruce collected the type of *Aristolochia Spruceï* Mast. at São Gabriel, and in the 1880's Barbosa Rodrigues collected *A. sylvatica* Barb. Rodr. at Manáos and *A. chrysochlora* Barb. Rodr. at Tarumá. These three species, like *Aristolochia Amesiana*, are apparently rare elements of the flora, for they are known only through the type collections. None is closely allied to *Aristolochia Amesiana* nor to each other.

It is an honor for me to dedicate this new endemic, albeit belatedly, to the late Professor Oakes Ames, in commemoration of his more than fifty years of service to Harvard University and his widespread influence as an outstanding orchidologist and economic botanist, a quietly inspiring teacher and a far-sighted administrator.

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MEDULLOSA OLSENIAE: A PERMIAN MEDULLOSA FROM NORTH CENTRAL TEXAS

BY

DAVID C. ROBERTS AND ELSO S. BARGHOORN

STRUCTURALLY preserved specimens of the Paleozoic seed fern *Medullosa* are represented in considerable abundance in the American mid-continent coal fields, where remains of the plant in the form of stems, petioles and roots are commonly found in the calcareous concretions known as coal balls. Very little information regarding the later Paleozoic development of this interesting and significant group of plants is available from American material, although much phylogenetic theory has been developed recently as the result of studies of its Carboniferous representatives (Baxter, 1949; Stewart, 1951). In view of the possible phylogenetic significance of geologically more recent representatives of *Medullosa*, the specimens comprising this study are described in some detail. To the knowledge of the authors, this description also constitutes the first report of the genus *Medullosa* from post-Carboniferous sediments of North America.

The specimens under consideration were found in section 754, Texan Emigration and Land Company Survey, 10 miles west of Newcastle, Young County, Texas. The material collected consists of fragments of decorticated stems and one petiole. The material occurred *in situ* in

sediments of the Moran Formation, near the base of the Permian system in north central Texas. The seven stem fragments, averaging 4 cm. in length and 2.5 cm. in diameter, are silicified, though with an admixture of calcium carbonate.

The full diameter and exact shape of the stem can only be inferred, owing to the more or less complete decortication which occurred prior to mineralization. In one specimen portions of the inner cortex are retained, though in all specimens there has been partial removal of the woody tissue itself, presumably due to decay and abrasion before petrifaction.

Medullosa Olsenae,[1] the description and diagnosis of which follows, is a medullosan stem of the "polystelic"[2] type. It is, however, characterized by the absence of the so-called "star rings" which feature many of the European Permian members of *Medullosa* described by Weber and Sterzel (1896) and subsequently figured by many authors. Our specimens indicate a stem, which, as deduced from the available material, developed a three- to five-membered vascular core, the components of which formed a system of anastomosing vascular bundles, each of which developed a concentric cambium and corresponding secondary xylem. The number of individual

[1] The specific name is given in recognition of Eleanor L. Olsen, wife of the Assistant Preparator of Vertebrate Paleontology of the Museum of Comparative Zoölogy, Harvard University, who collected the specimens in the field and made them available for study.

[2] The term stele in this discussion is restricted to the primary vascular system of the plant. Inasmuch as the primary vascular system *in toto* is designated stele, the use of the term "polystele" is seemingly illogical. However, usage has tended toward adoption of descriptive anatomical terms derived from living plants even though applied to fossil forms. Until a uniform system of terminology is developed for application to structures of both living and fossil vascular plants, it seems necessary to follow the present conventions in descriptive terminology.

"steles" fluctuates from three to five (Plate LXI, figs. 1 to 9). One specimen exhibits five "steles" throughout its length (Plate LXI, fig. 5): one other shows four "steles" at both ends. One specimen shows three "steles" at one end and four "steles" at the other. Two of the "steles" may be seen to join on the exterior surface. From the appearance of this one specimen there is one stelar fusion per four centimeters of stem length, and it seems reasonable to conclude that the "steles" anastomose throughout the length of the stem, though probably not at regular intervals. The maximum and minimum number of stelar components in *M. Olseniae*, from basal to apical portions of the stem, is not known owing to our fragmentary material. The evidence at hand indicates that the stem of *M. Olseniae* possessed a vascular core of three to five unit "steles," widely and unevenly spaced around a central parenchymatous core, and in varying degrees of coalescence throughout their vertical extent. Without the attached leaf bases, it is not possible to more than suggest that stelar fusions are associated with the insertions of the leaves.

In *M. Olseniae* the "steles" are more or less elliptical in outline, when seen in transverse sections of the stem, and, collectively, appear to be in elliptical arrangement around the central parenchymatous "pith" (Plate LXIII, figs. 1 and 2; Plate LXI, figs. 1 and 2). It is possible that the unit "steles" were originally arranged in an ellipse and the present more flattened arrangement is due to compression before mineralization. There is no indication of the medullary bundles or "star rings" which constitute such a conspicuous feature of many European species of *Medullosa* (Plate LXII, figs. 8 to 11). The individual stelar units of *M. Olseniae* are from one to three centimeters in cross sectional diameter, along their longer axes. The larger "steles" represent stelar fusions

and their "normal" cross sectional diameter appears to be from one to two centimeters. Each stelar unit is moderately endocentric with respect to the development of secondary wood.

The primary wood, in cross section, consists of an oval to oblong core, comprised of groups of approximately five to fifteen tracheids, each group surrounded by parenchyma, which, in our specimens, is very poorly preserved. The primary xylem clusters are rather evenly distributed throughout the parenchymatous tissue surrounding them. Protoxylem cells of the bundles cannot be distinguished with certainty, though in the better preserved specimens they appear to be mesarch in arrangement.

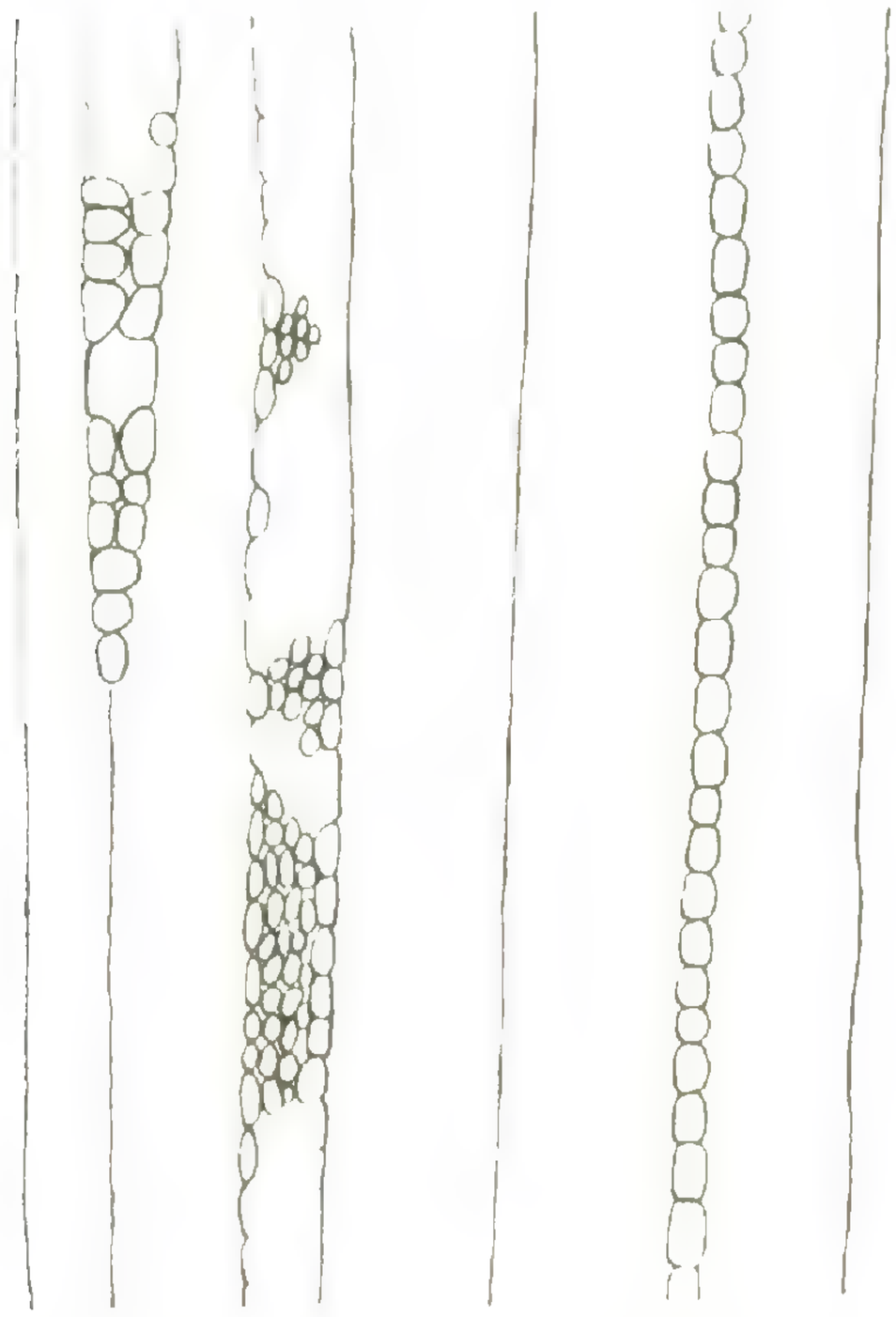
The secondary xylem develops as an eccentric cylinder around each "stele." Unequal cambial activity is evidenced in the greater development of secondary tissue on the inner part of each cylinder, thus producing an endocentric development as found in many Carboniferous species of *Medullosa*. The tracheids are arranged in conspicuous radial rows, usually paired, and each of the double rows is separated by rays of varying width (Plate LXIV, figs. 1, 2 and 3). An interesting feature of the paired radial rows is the alternating position of the individual tracheids with respect to each other (Plate LXIV, fig. 3). This geometric arrangement is probably indicative of extreme apical elongation, or sliding growth, during differentiation of the cambial derivatives in the newly formed secondary wood. It is probably also due in part to changes in spatial relationship of the cells during degradation preceding mineralization. The tracheids are extremely long and of fairly large cross sectional diameter. In the older secondary xylem tracheids range from 80 to 90 μ in diameter, although the outermost cells in several specimens are of smaller size, possibly indicating that the plants had been killed during active secondary growth

before cell enlargement was completed. It seems less likely that an actual diminution of the size of mature cells occurred during ontogeny of the cambium. Alternate, crowded, circular bordered pits occur on the radial walls of the tracheids. The pits on the larger tracheids range from five to six rows on each radial wall (Plate LXIII, fig. 3). The pit orifice, in cells with a sufficiently preserved secondary wall residue, tends to be elliptical with the long axis oriented transversely to the axis of the cell.

Tyloses occur in great abundance within the lumina of the tracheids, and are of the sclerotic type, with thick secondary walls. Tyloses are quite rare in the secondary xylem of living Gymnosperms, although occasionally they occur in roots of conifers. The tyloses of *M. Olseniae* are one of the most conspicuous features in longitudinal sections of the secondary wood, as shown in Plate LXIV, figs. 4 and 5. Despite poor preservation of histological detail in the specimens at hand, it is apparent that they developed by protrusion of the cytoplasm from adjoining ray cells through the bordered pits of adjacent tracheids. Inasmuch as nearly every tracheid was in direct contact with ray cells throughout its length, the capacity for tylose formation can be partially explained. However, the tendency for such outgrowths to develop must have been unusually strong, as evidenced by the formation of a tylose within a tylose as shown in the tracheid figured in Plate LXIV, fig. 6. Such a cytological anomaly as the latter is very difficult to interpret, yet this seems the only explanation for the structure shown.

The rays are poorly preserved and in large part tangentially crushed to an amorphous or alveolar mass of cell wall residues. In better preserved areas the rays are seen to be of two types: uniseriates and very high multiseriates. The latter are four to six cells in width, of which

the flanking cells are much larger than the cells in the interior of the ray. No conspicuously vertically elongated cells can be observed either in the uniseriate rays or at the margins of the multiseriates (Text Fig.).



Text Fig. Tangential section of secondary wood, showing portions of one uniseriate ray and two multiseriate rays. The center ray, as characteristic of the larger rays, is composed of cells of two sizes; the larger along the margin, and the smaller, internal. The outlines of the tracheids, rays, and some of the ray cells were drawn with a camera lucida. Other ray cells were drawn by direct comparison with the thin section. × 50.

Cells of the cambium are not visible, but the phloem tissue is preserved in some areas. The sieve elements are crushed, but appear as double or triple rows between the flaring phloem rays (Plate LXIV, fig. 1).

As noted, very little of the cortex was preserved, and leaf traces were not seen. A single row of sclerotic strands, just outside the phloem region, extends around the secondary body of each woody cylinder. There is no evidence of internally developed periderm.

Diagnosis

Medullosa Olseniae *Roberts & Barghoorn sp. nov.*

A stem, elliptical in cross sectional outline, approximately two × four cm. in diameter at outer margins of the "polystele." The "polystele" consists of three to

five "steles" arranged concentrically around a central parenchymatous core. "Steles," including the surrounding secondary wood, elliptical in outline in transverse section, and varying from one to three cm. along the long axis. Secondary xylem forming a concentric cylinder around each "stele," but, to a moderate degree, endocentrically developed. "Star rings" and accessory internal bundles absent. Primary wood arranged in small aggregates, or scattered bundles surrounded by parenchyma. Secondary wood consists of tracheids and rays. Tracheids large, with closely spaced circular bordered pits on the radial walls. Rays very abundant and of two types: uniseriate and multiseriate, the latter four to six cells in width. The rays flare conspicuously in the phloem.

Locality and horizon: Lower Permian, Moran Formation, Section 754, Texan Emigration and Land Company Survey, 10 miles west of Newcastle, Young County, Texas.

Collected by: Eleanor L. Olsen.

Material: Seven silicified stem fragments.

Type: Seven stem fragments and 7 ground sections in the Paleobotanical Collections of Harvard University, No. 50,001 to 50,007.

Discussion

The specimens under consideration clearly conform to the definition of the genus *Medullosa* in possessing "polystelic" structure, with each stelar component developing, independently, its own cylinder of secondary tissues. The known members of the genus may be divided into three geographic and stratigraphic categories: 1) species of the European (German) Permian; 2) species of the European Carboniferous; and 3) species of the American Carboniferous (chiefly mid-Pennsylvanian?).

Comparison of the stelar patterns and stem structure of the European Permian forms (Plate LXII, figs. 8 to 11) with *M. Olseniae* rules out any close relationship. The former are all characterized by elongated and peripherally

arranged "steles," with "star rings" in the central parenchymatous region, and in some forms successive cambia in the cortical zone. These forms are far more complex than *M. Olseniae*, and, indeed, represent some of the most bizarre modifications of vascular tissue among Paleozoic plants.

Comparison of the new species must therefore be made with forms described from the European and American Carboniferous. In many respects *M. Olseniae* is within the range of variation of the Carboniferous forms, especially in anatomical details, such as tracheary pitting, size of the stelar units, endocentricity of the secondary cylinders, and structure of the rays. Differences in the structural variation of these anatomical features comprise the primary basis for establishment of several species of American forms, although these differences may actually be merely structural variables of the same species. In the absence of more complete material from a single plant, however, the establishment of species categories based on anatomical differences in fragmentary specimens seems the only reasonable procedure in the taxonomic treatment of Paleozoic plants and other extinct groups of plants. On the basis of the structure of the primary xylem and of the secondary xylem, *M. Olseniae* differs in no fundamental way from the carboniferous forms. If the number of component "steles" in the "polystele" is considered a basic taxonomic character in *Medullosa* (which may reasonably be questioned in certain cases), *M. Olseniae* differs from previously described forms in that it consistently possesses three to five "steles." Carboniferous forms described in the literature may be grouped into two major categories: 1) those with two to four "steles"; and 2) those with six to eight "steles." In the first group those with two "steles" are *M. distelica* Schopf (1939) and *M. pandurata* Stewart (1951);

those with three are *M. anglica* Scott (1899), *M. Thompsonii* Andrews (1945), *M. endocentrica* Baxter (1949), *M. pusilla* Scott (1914), *M. elongata* Baxter (1949) and *M. Noei* Steidtmann (1944); and that with four "steles" is *M. centrofilis* De Fraine (1914). The latter species is curious in possessing one small "star ring," flanked by three larger "steles" (Plate LXII, fig. 2). The second group consists of one form only, *M. primaeva* Baxter (1949), which possesses six to eight "steles" of varying size (Plate LXII, fig. 3).

In addition to exhibiting a presumably significant difference in the number of unit "steles," *M. Olseniae* presents a perhaps more significant character in the possession of a central parenchymatous core devoid of "star rings" or other supernumerary vascular strands. Because of these two structural features, it seems desirable to propose a new specific name for the *Medullosa* described in this study.

Owing to its occurrence in post-Carboniferous sediments, *M. Olseniae* is of interest in the interpretation of phylogenetic trends in the Medullosan group. In comparison with Permian representatives in western Europe it is surprisingly simple in structure, and may be interpreted as structurally more primitive. However, it is difficult to incorporate *M. Olseniae* into the phylogenetic schemes proposed for the American Carboniferous forms by Baxter (1949) and Stewart (1951). Until more is known of the possible variation within a single "species" of *Medullosa*, however, phylogenetic schemes will probably require periodic modification.

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ILLUSTRATIONS

EXPLANATION OF THE ILLUSTRATION

PLATE LXI. Stelar organization in the genus *Medullosa*. Figs. 1–9, *Medullosa Olseniae;* figs. 10, 11, Carboniferous species.

Fig. 1. Reconstruction of the vascular system of *M. Olseniae*, showing the flat ring of "steles," based on specimen diagrammed in fig. 5, and oriented similarly. The crushed internal parenchyma has been restored to its assumed dimensions. × 1.5

Fig. 2. Reconstruction of the vascular system in another specimen of *M. Olseniae*, based on the specimen drawn in fig. 4, and oriented similarly. The largest "stele" appears to be the result of the fusion of two. (See fig. 6 and 7.) × 1.5

Fig. 3. Drawing of the specimen diagrammed in figs. 6 and 7, to show the appearance of the fossils. (See fig. 7.) × 1.5

Fig. 4. Stelar organization of the one specimen which shows uncrushed internal parenchyma. (See Plate LXIII, fig. 1) × 1.5

Fig. 5. Diagram of the specimen containing portions of five "steles." (See Plate LXIII, fig. 2.) × 1.5

Fig. 6. Appearance of one end of specimen which shows a stelar fusion. Steles 3 and 4 are separate. × 1.5

Fig. 7. Appearance of the other end of the specimen drawn in fig. 6. Steles 3 and 4 have fused. × 1.5

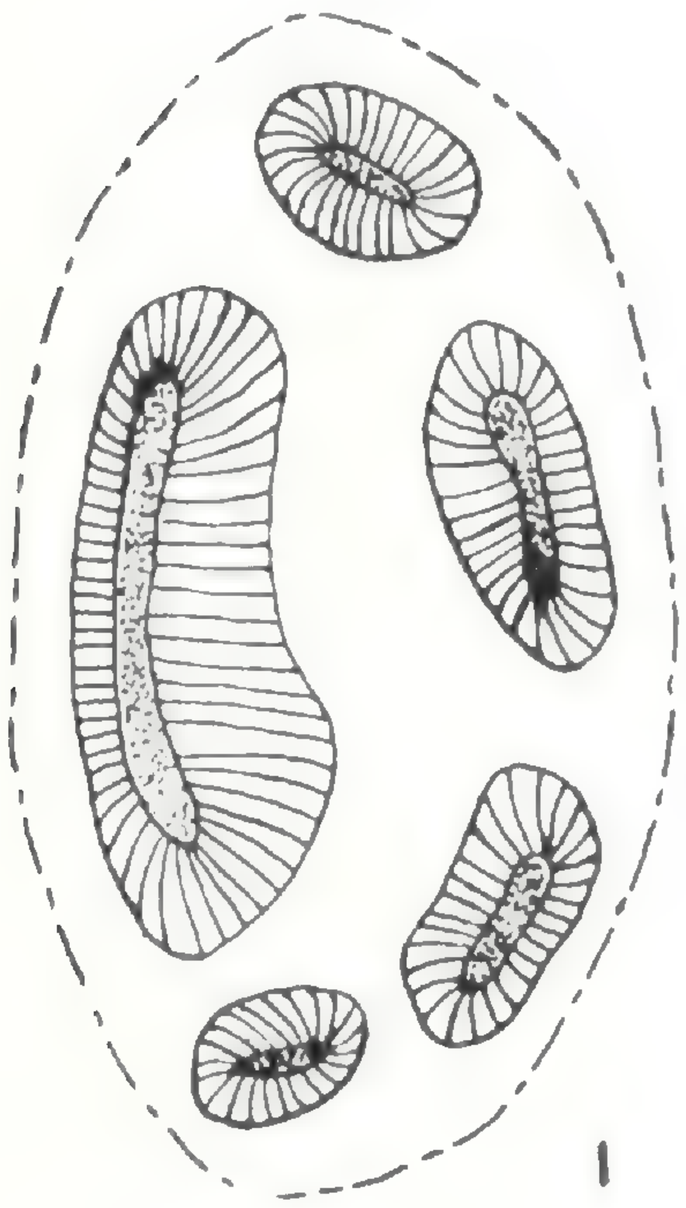
Fig. 8. A less complete specimen of *M. Olseniae*, which shows secondary wood on both sides of the primary body. × 1.5

Fig. 9. Another specimen of *M. Olseniae*, which contains a virtually complete "stele." × 1.5

Fig. 10. *M. pusilla* Scott. From Baxter, after Andrews. × 1.8

Fig. 11. *M. distelica* Schopf. From Baxter, after Andrews. 1.8

Plate LXI



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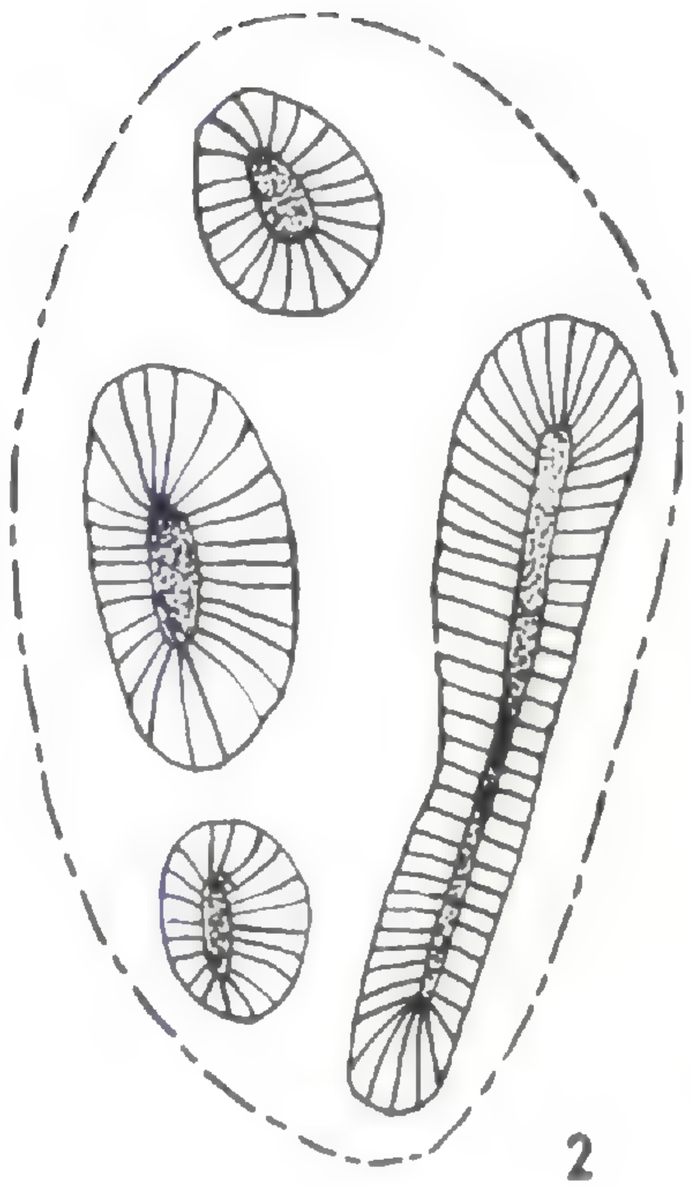

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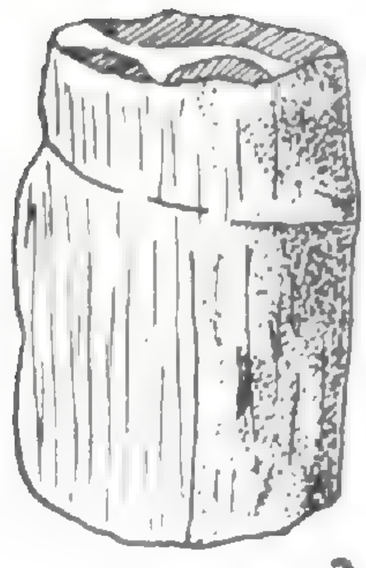

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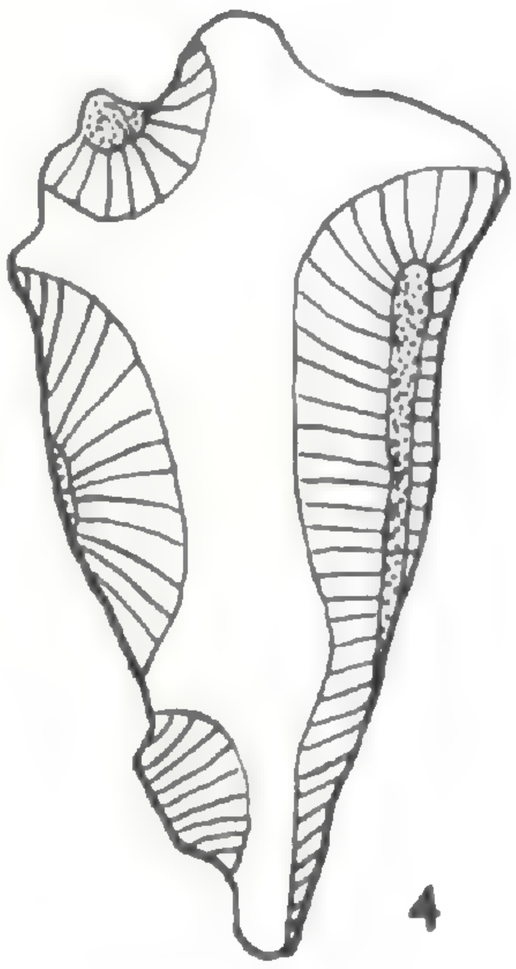

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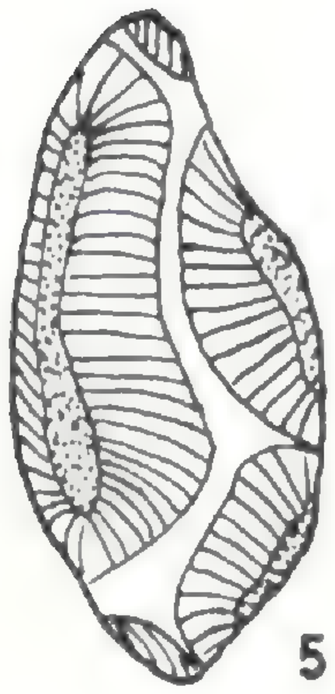

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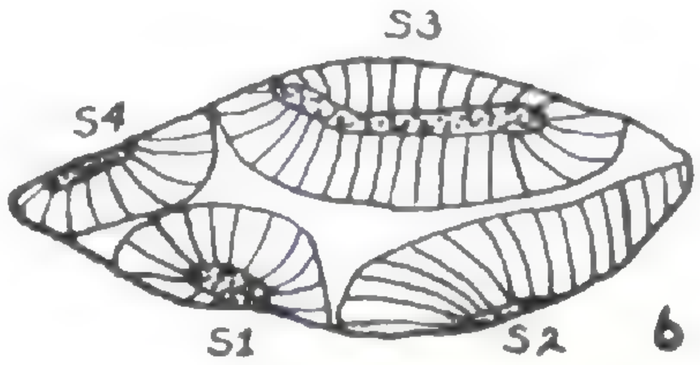

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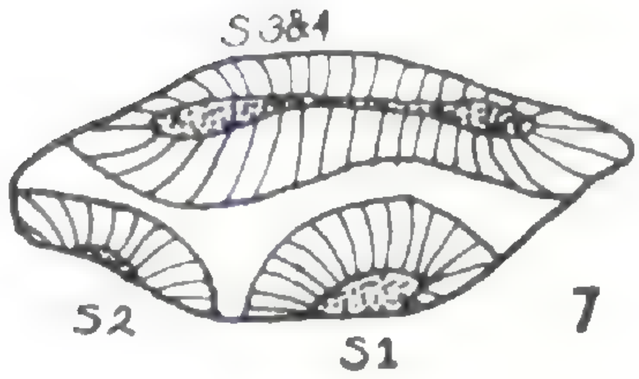

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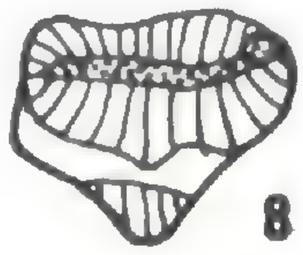

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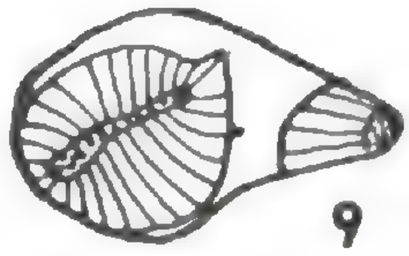

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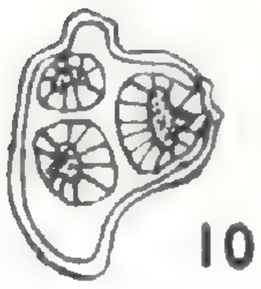

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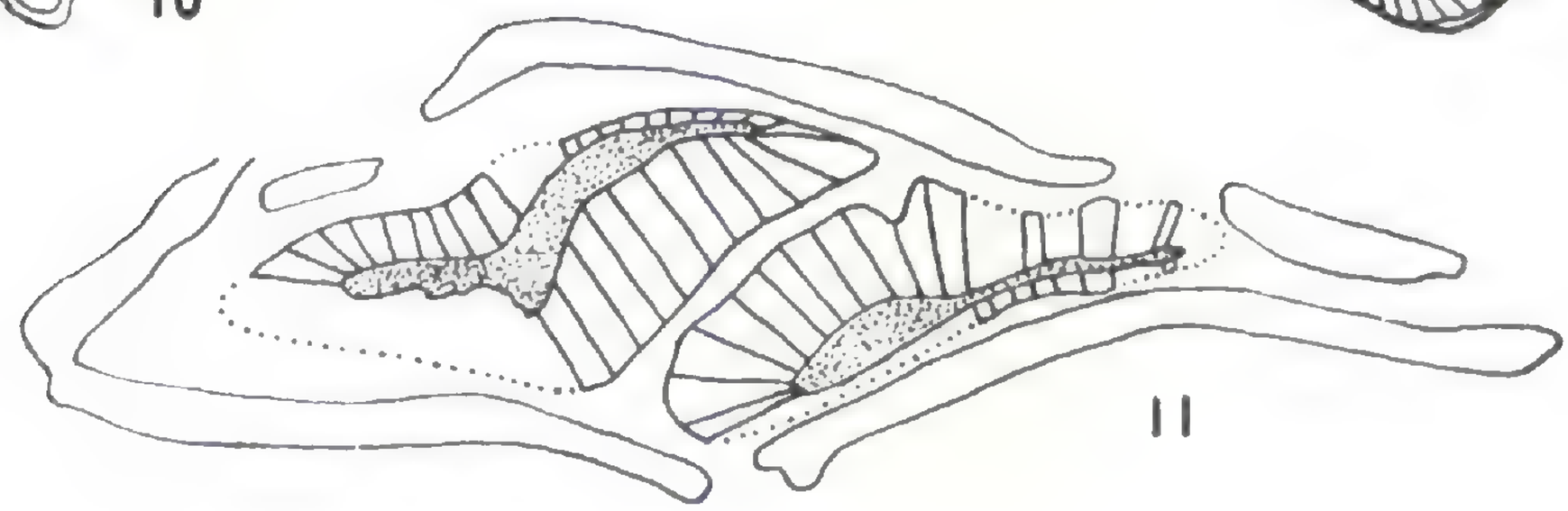

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EXPLANATION OF THE ILLUSTRATION

PLATE LXII. Stelar organization in the genus *Medullosa*, continued.

Figs. 1–7. Carboniferous species. These, with the addition of those figured on Plate LXI, figs. 10 and 11, represent all the known Carboniferous species, with the exception of *M. Noei*. The stelar pattern of *M. Noei* does not resemble that of *M. Olseniae*, and is omitted from the figures because of its large size. Figs. 8–11 show the known Permian species from Germany.

Fig. 1. *M. elongata* Baxter. From Baxter. × 1.8

Fig. 2. *M. centrofilis* De Fraine. From Baxter, after Andrews. × 1.8

Fig. 3. *M. primaeva* Baxter. From Baxter. × 1.8

Fig. 4. *M. anglica* Scott. From Baxter, after Andrews. 0.75

Fig. 5. *M. endrocentrica* Baxter. From Baxter. 1.8

Fig. 6. *M. pandurata* Stewart. From Stewart. × 0.70

Fig. 7. *M. Thompsonii* Andrews. From Baxter, after Andrews. × 1.8

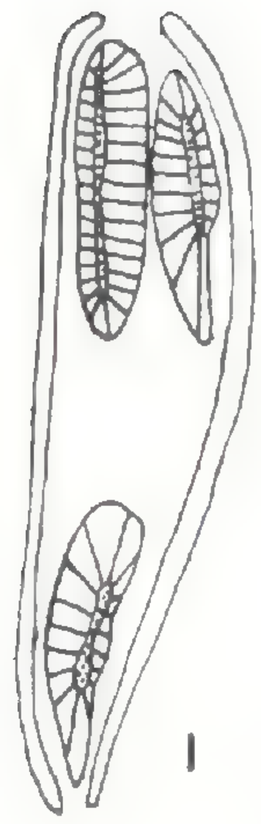
Fig. 8. *M. Leuckartii* Göppert and Sterzel. This and the following diagrams show the characteristic peripheral "steles" and accessory secondary woody cylinders with included "star rings" which are found in the Permian species. This stelar organization is more complex than is found in the Carboniferous species, and is clearly more specialized. From Weber and Sterzel. 0.75

Fig. 9. *M. porosa* Cotta. From Weber and Sterzel. × 0.75

Fig. 10. *M. stellata* Cotta. From Weber and Sterzel. 0.75

Fig. 11. *M. Solmsii* Schenk. From Weber and Sterzel. × 0.75

Plate LXII



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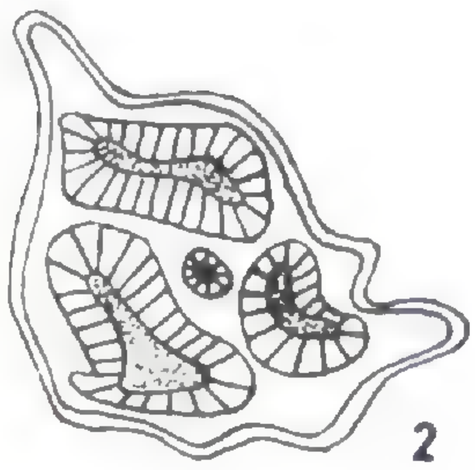

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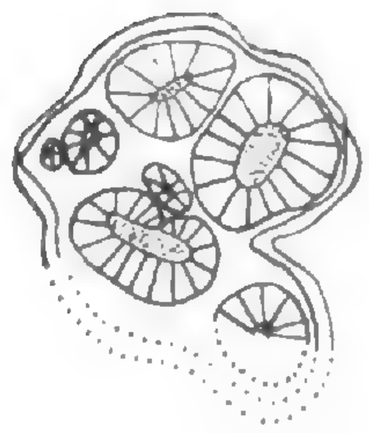

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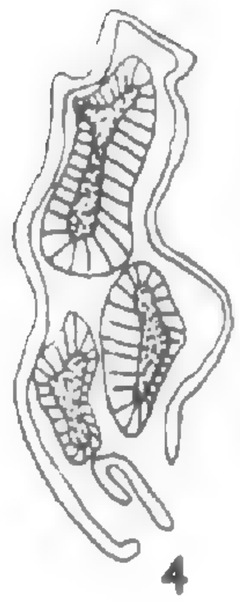

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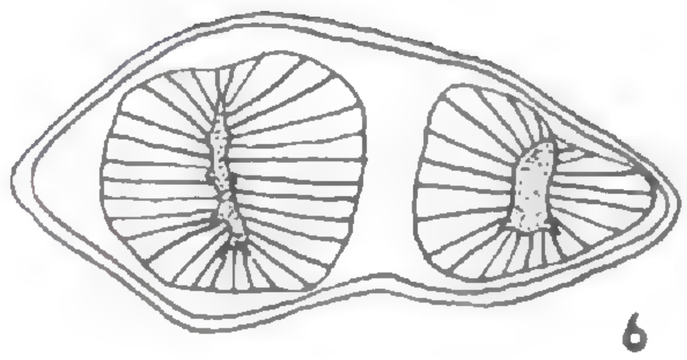

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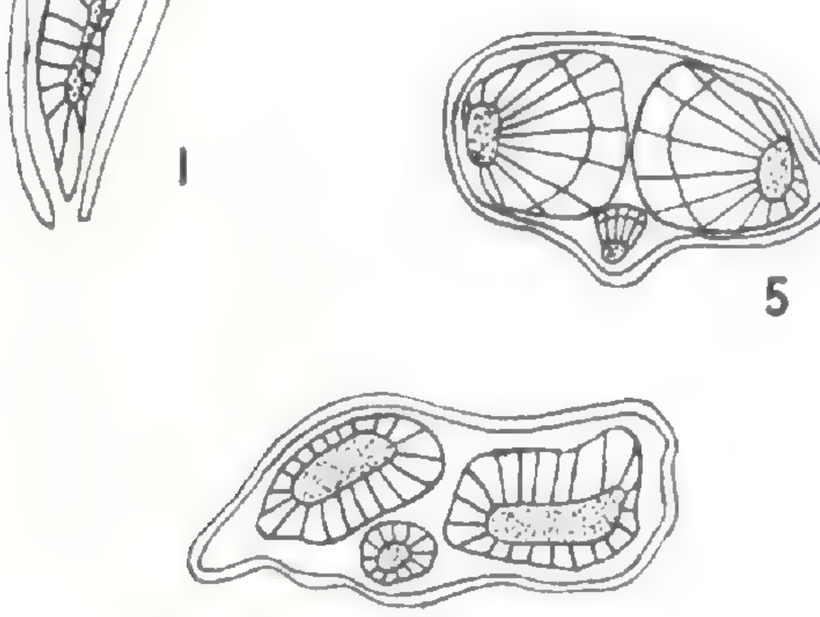

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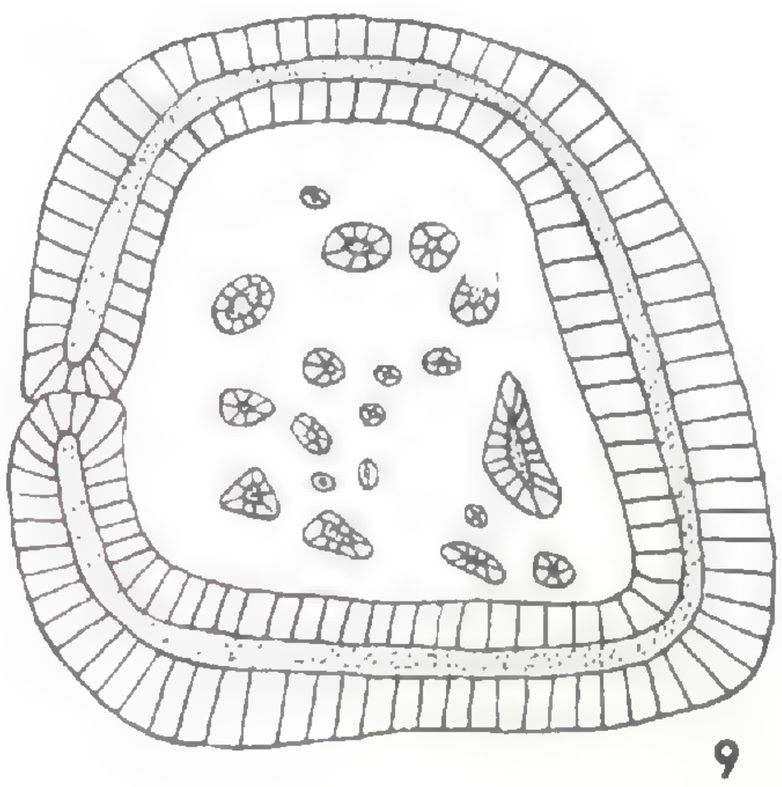

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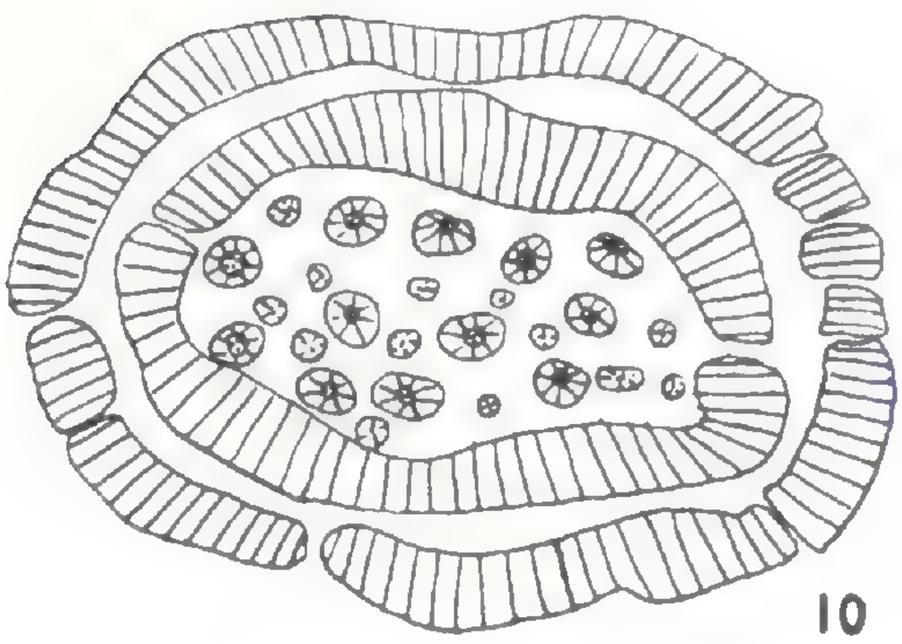

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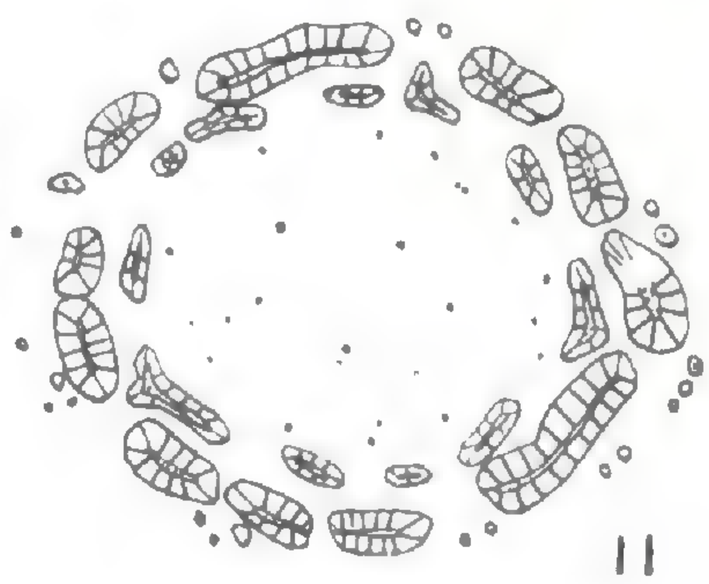

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EXPLANATION OF THE ILLUSTRATION

PLATE LXIII. Fig. 1. Transverse section of *M. Olseniae*, showing specimen with portions of four "steles" grouped around the central core of parenchyma. Note arcs of internally developed phloem. × 1.5

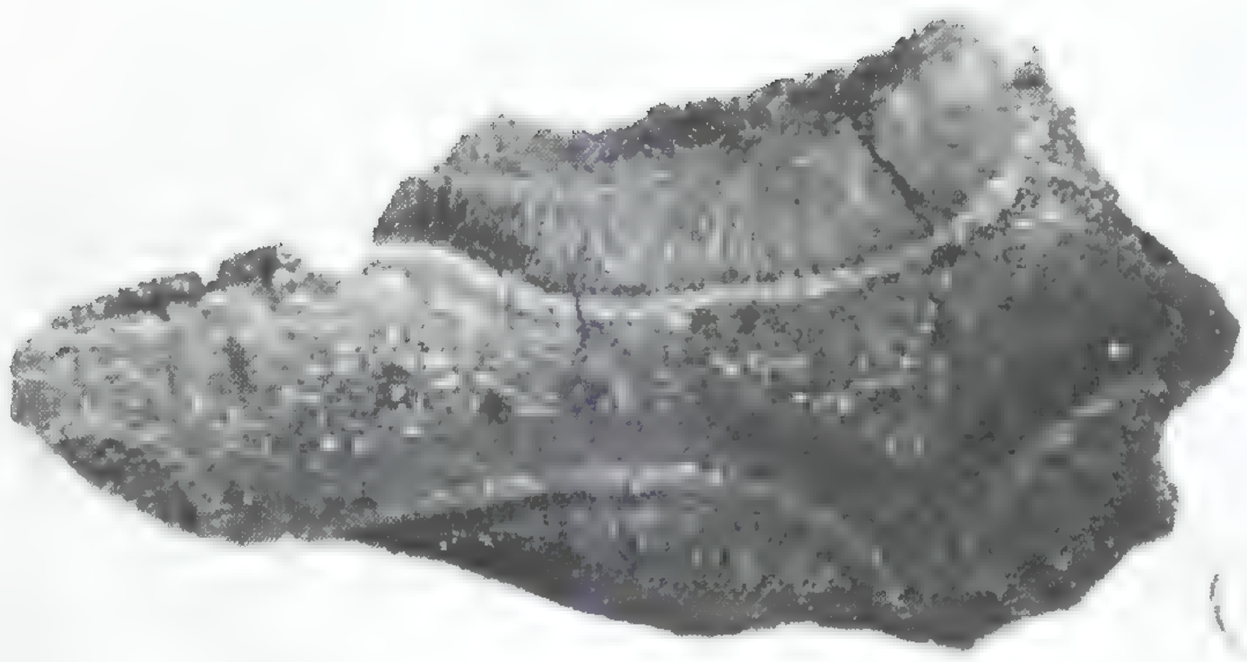
Fig. 2. Transverse section of *M. Olseniae*, showing portions of five "steles" and the crushed central parenchymatous core. × 1.5

Fig. 3. Radial longitudinal section of *M. Olseniae*, showing the alternate multiseriate circular bordered pits on the radial wall of a tracheid. × 115

Fig. 4. Transverse section, showing innermost secondary xylem and part of the primary wood of a "stele." The lumena of the tracheids of both primary and secondary xylem are filled with a black amorphous substance, partially organic and partially mineral. × 25

Fig. 5. Same section as fig. 4, but more highly magnified. Note the aggregates of primary xylem tracheids interspersed with irregular areas of crushed parenchyma cells. × 35

PLATE LXIII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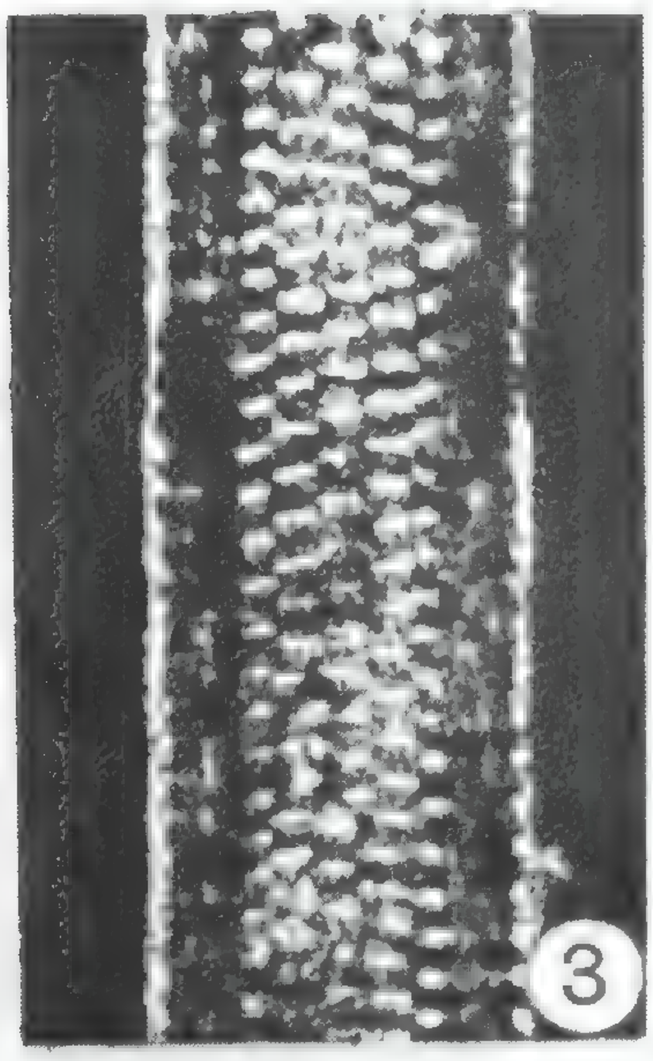
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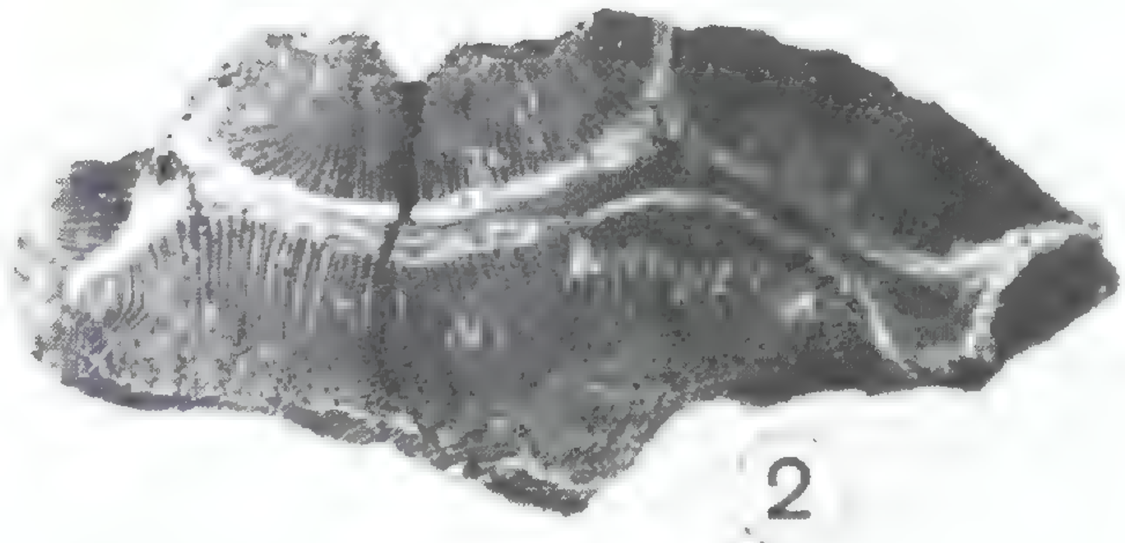
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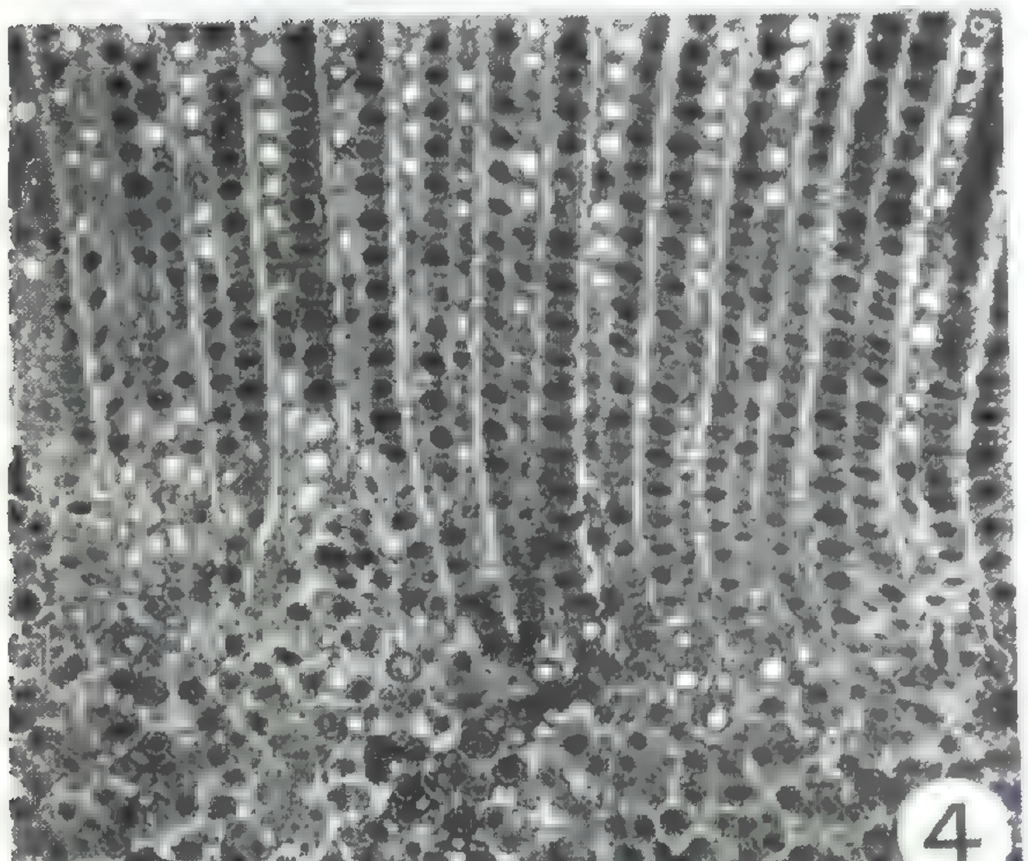
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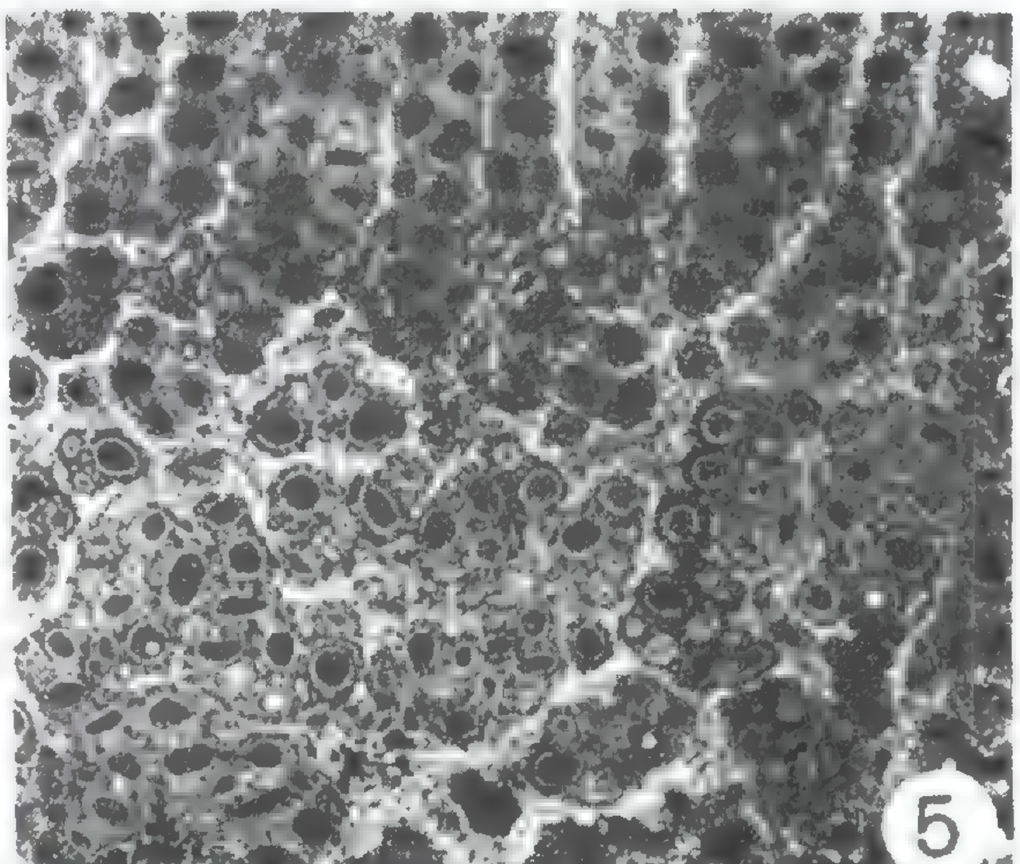
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EXPLANATION OF THE ILLUSTRATION

PLATE LXIV. Sections of the secondary xylem of *Medullosa Olseniae*.

Fig. 1. Transverse section showing the outermost secondary xylem and the phloem of one of the "steles." Note the radial rows of sieve elements (light) and the flaring rays of the phloem (dark) in the upper third of the figure. × 20

Fig. 2. Transverse section showing radial rows of tracheids separated by multiseriate rays of crushed cells. The lumena of the tracheids are black. 60

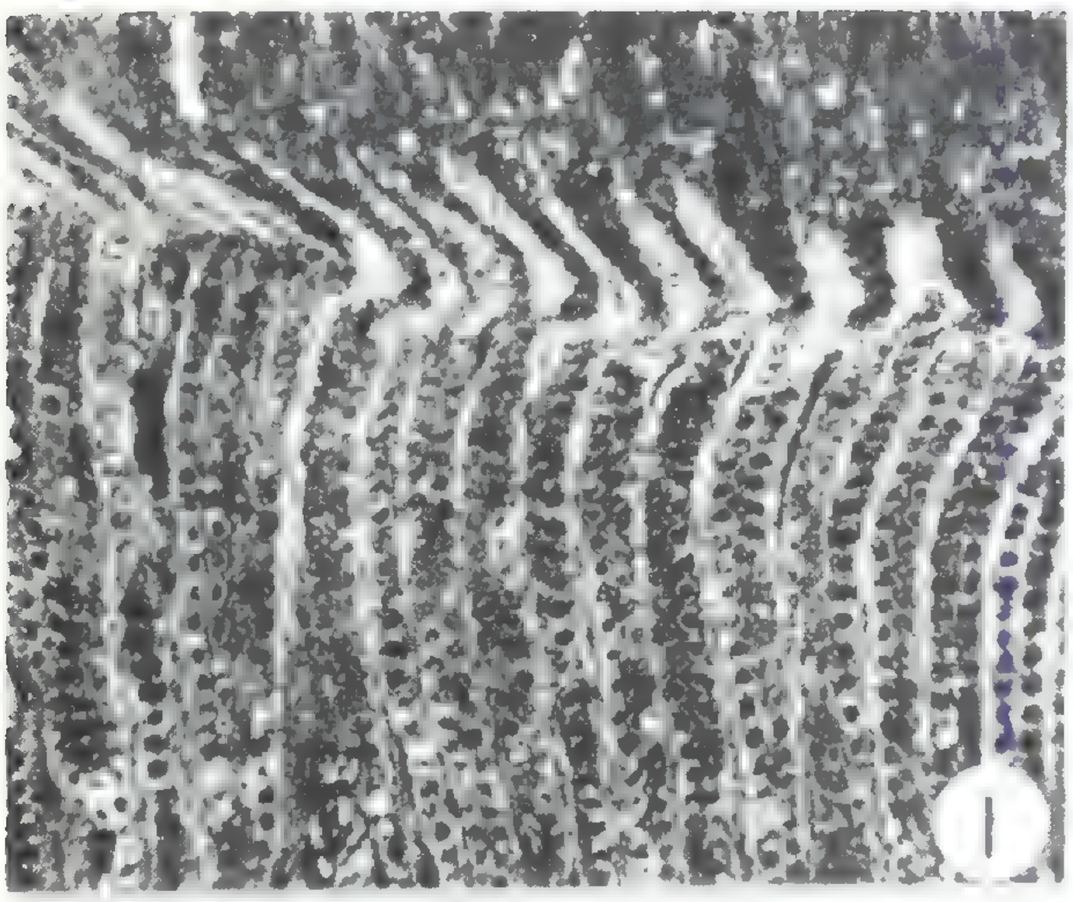
Fig. 3. Same section shown in fig. 2, but more highly magnified. Note the multiseriate rays separating the double rows of alternately spaced tracheids. The black contents of the lumena are in sharp contrast to the bright layers of the inner tracheid wall and the pit chambers, the latter represented by bright beads. 115

Fig. 4. Tangential longitudinal section showing the long tylose filled tracheids and closely spaced crushed rays of the secondary xylem. 25

Fig. 5. Same section shown in fig. 4, but more highly magnified. The poor preservation of the rays is evident in the amorphous appearance of tissue between the tracheids. Note tyloses in the tracheids. × 60

Fig. 6. Same section shown in fig. 4, but more highly magnified. The spherical structure in the center of the figure is a tylose which apparently developed within the pre-existing tylose of the tracheid. That the structure shown is organic and a part of the plant tissue is evident by the similarity in its optical properties with those of the surrounding cell wall residues. The upper wall of the primary tylose is represented by the rounded cell wall in the lumen of the tracheid in the upper part of the figure. × 260

Plate LXIV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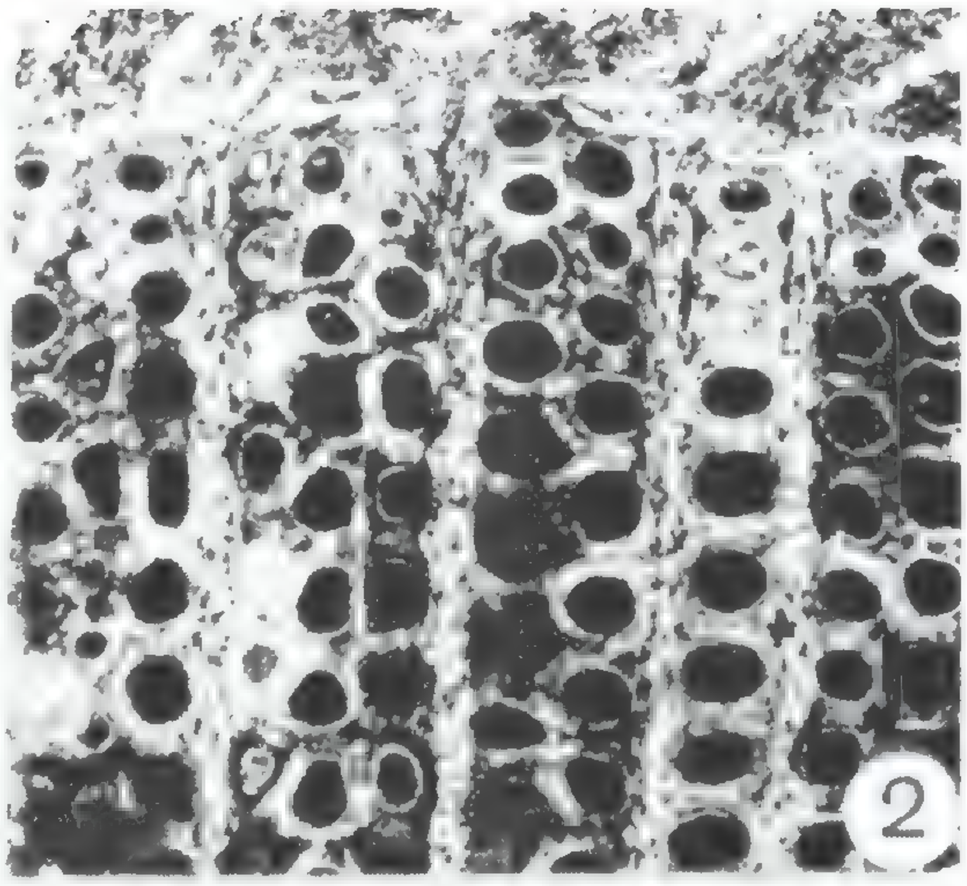
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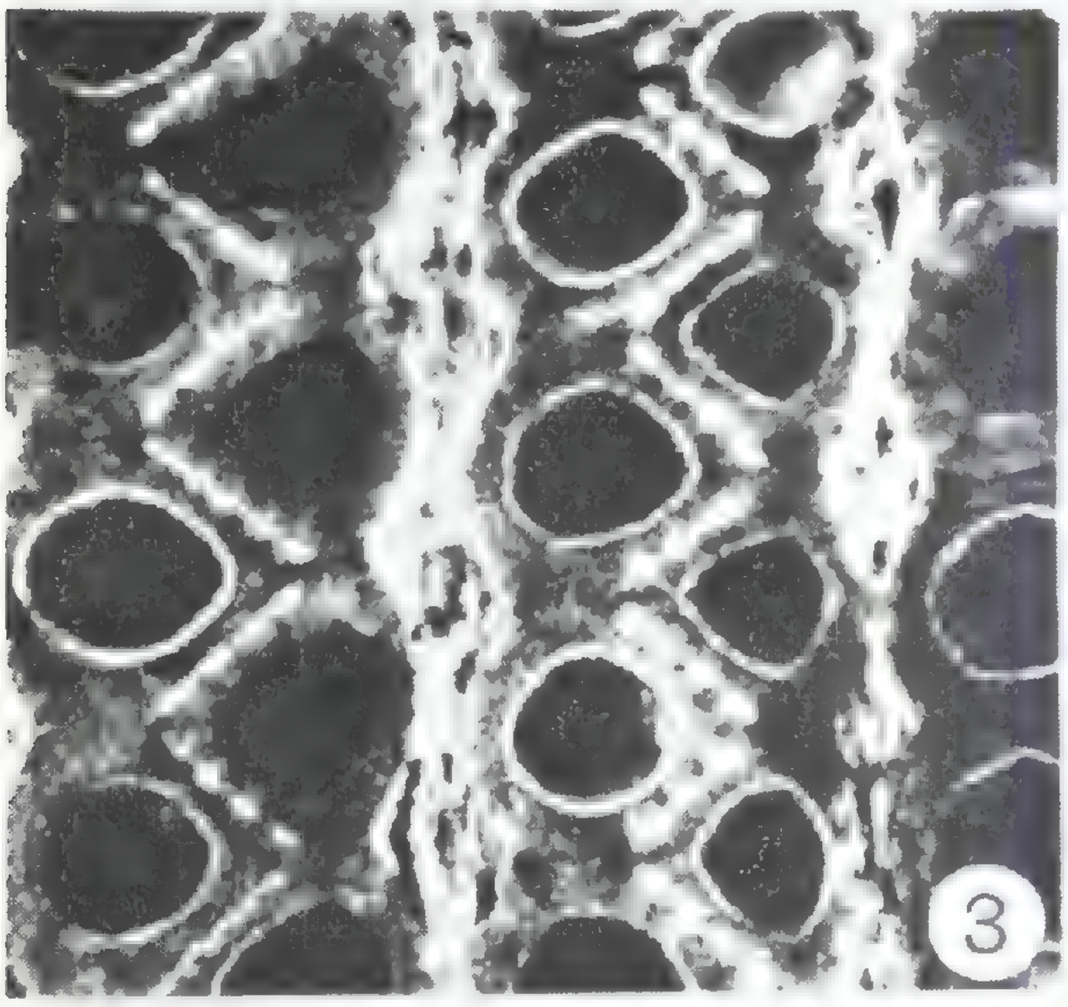
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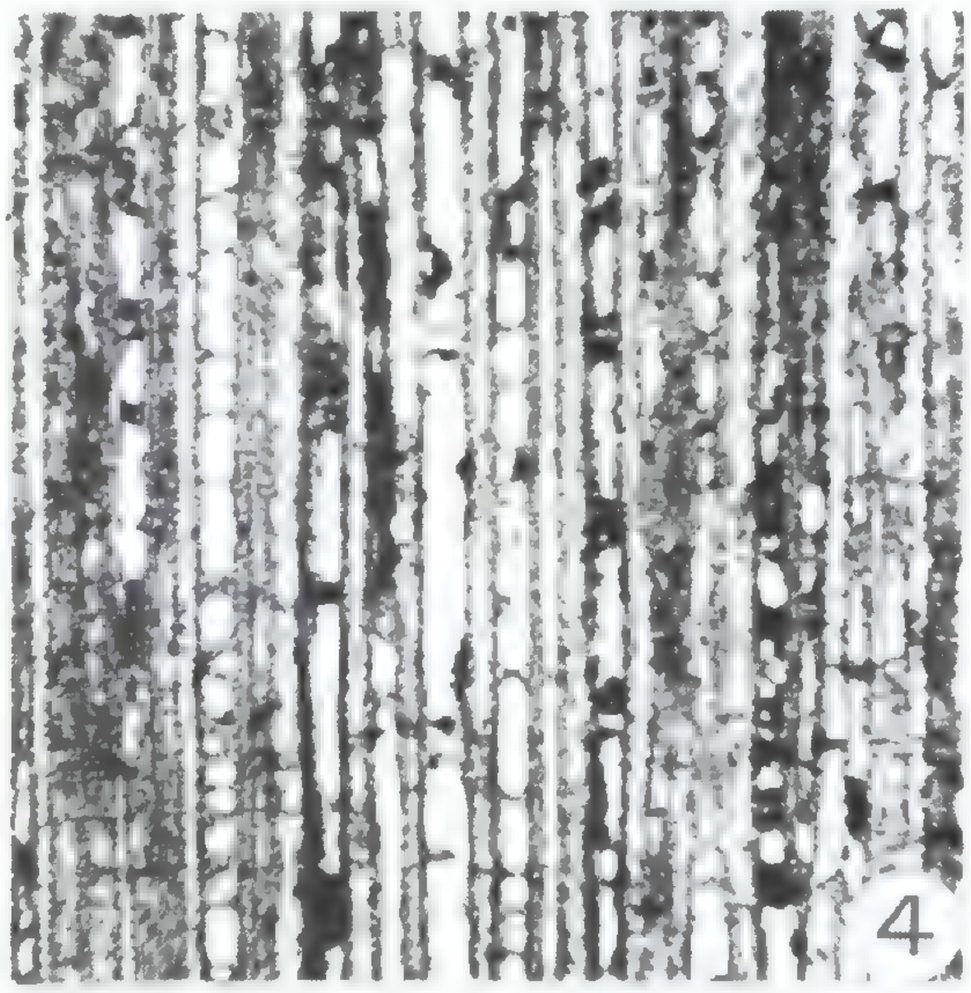
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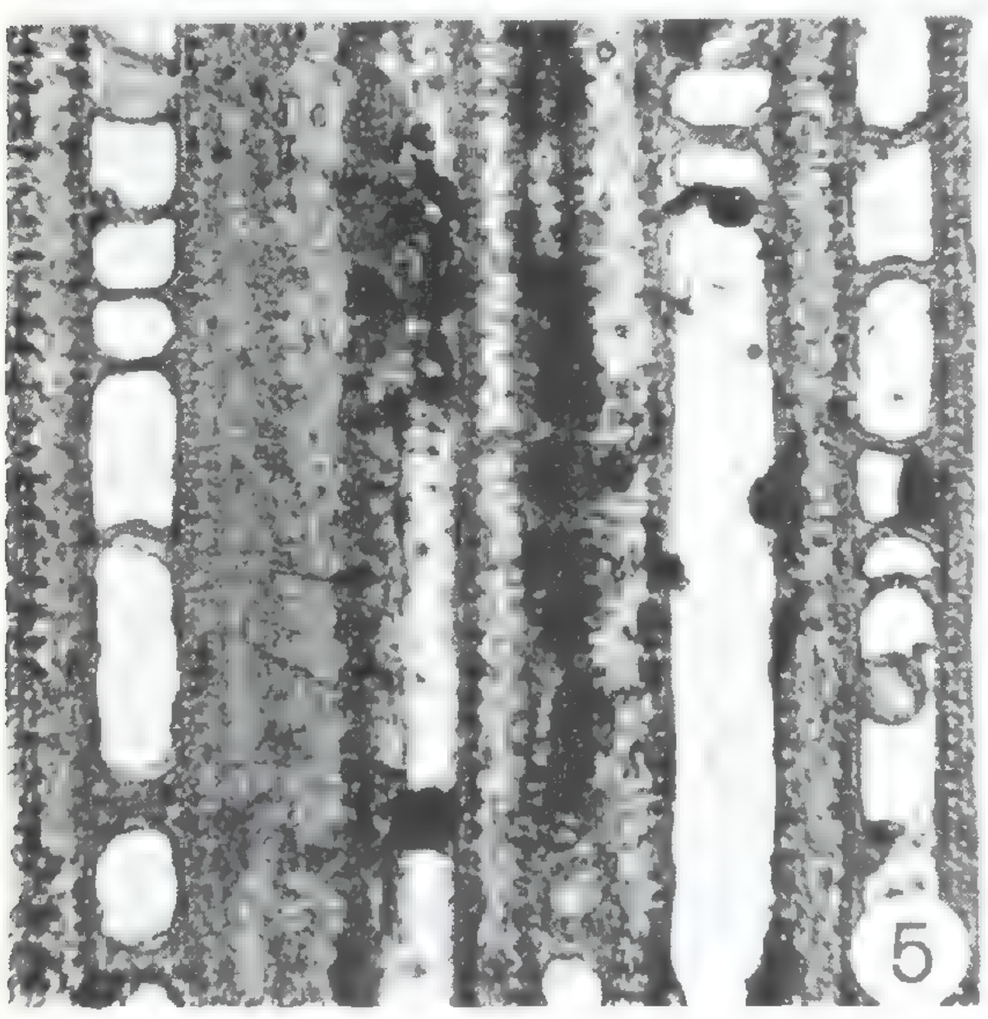
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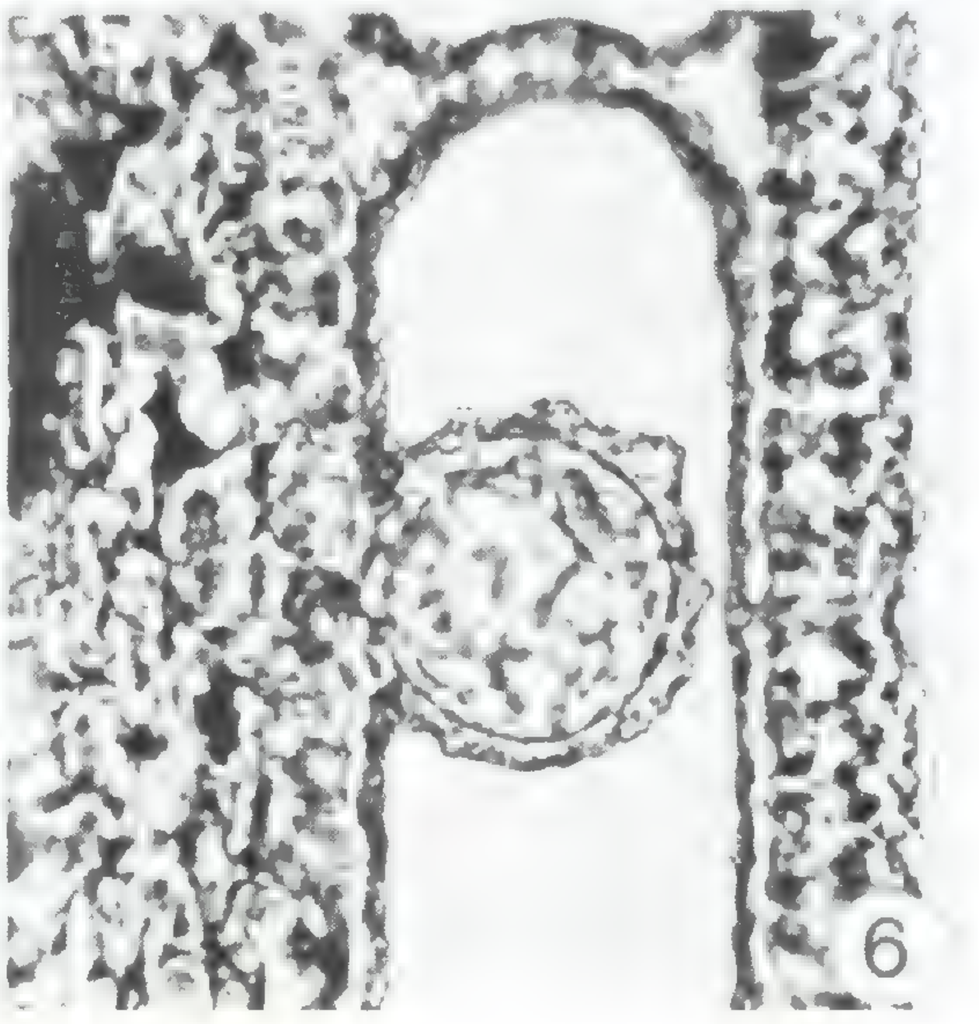
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BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, MAY 29, 1952 VOL. 15, NO. 8

STUDIES IN THE GENUS MICRANDRA I
THE RELATIONSHIP OF THE GENUS CUNURIA TO MICRANDRA

BY

RICHARD EVANS SCHULTES[1]

IN connection with a study of the genus *Hevea*, it has been found advisable to carry out investigations in genera which are believed to be related to that of the commercial rubber plant. Some of the results of this collateral research were published in 1947, when Baldwin and Schultes summarized (Bot. Mus. Leafl. Harvard Univ. 12 (1947) 325–364) and brought up to date our knowledge of the genus *Cunuria*. Since 1947, field studies and taxonomic investigations of *Hevea*, *Cunuria* and *Micrandra* have been continued. The following notes are necessitated by our better understanding of the relationships of the last two groups of plants and are herein presented in preparation for a monographic treatment of *Micrandra*.

Micrandra was described by Bentham in 1854 (in Hooker's Journ. Bot. 6 (1854) 371). It is conserved over *Micrandra* R. Brown (in Bennett Pl. Jav. Rar. (1844) 237). The type species was *Micrandra siphonioides* Bentham from the Rio Uaupés in the upper Rio Negro basin

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of Brazil. *Cunuria* was described by Baillon in 1864. The type species of *Cunuria* was *C. Spruceana* Baillon from the uppermost reaches of the Río Negro and from the Río Casiquiare in Venezuela.

Cunuria has been separated from *Micrandra* in the past by the following characters:

Cunuria	*Micrandra*
Calyx deeply cup-shaped	Calyx open, rather shallowly bowl-shaped
Sepals strongly imbricate	Sepals imbricate or valvate
Staminate disk absent	Staminate disk glandular, five-lobed
Pistillate disk cup-shaped, glandular-lobate or absent	Pistillate disk annular and thin
Stamens ten	Stamens five to seven
Seeds ecarunculate	Seeds carunculate
Leaves entirely glabrous	Leaves usually variously pilose beneath

Field studies and collections of hundreds of individuals of various species of *Cunuria* and *Micrandra* made in 1947–1948 in the upper Río Negro basin of Brazil and Colombia suggested the possibility that these two hitherto apparently well-defined genera might represent but a single concept. Critical examination of a portion of the ample material collected during these field studies, especially of the collections of the new species *Micrandra Lopezii* and *M. Rossiana* herein described, and abundant flowering material of what has been known as *Cunuria crassipes*, indicates that there is definitely but one genus, since the characters hitherto used to separate the two concepts break down and overlap. It becomes necessary, therefore, to transfer the recognized concepts of *Cunuria* to *Micrandra*.

Micrandra australis (*R. E. Schult.*) *R. E. Schultes comb. nov.*

Cunuria australis R. E. Schultes ex Baldwin & Schultes

in Bot. Mus. Leafl. Harvard Univ. 12 (1947) 333, t. 42.

Micrandra glabra (*R. E. Schult.*) *R. E. Schultes comb. nov.*

Cunuria glabra R. E. Schultes ex Baldwin & Schultes in Bot. Mus. Leafl. Harvard Univ. 12 (1947) 339, t. 44.

Micrandra glabra, described from material collected in British and Dutch Guiana, has recently been found in southern Venezuela.

Venezuela: State of Bolívar, Ptari-tepuí, lower south-facing slopes, between Río Karuai and first ridge above Río Karuai. Alt. 1220 m. "Tree 100 feet tall. Fruit edible. Leaves coriaceous, deep green above, pale green below. *Suru-wai-yek.*" November 28, 1944, *Julian A. Steyermark 60,689.*

Micrandra Gleasoniana (*Croiz.*) *R. E. Schultes comb. nov.*

Cunuria Gleasoniana Croizat in Bull. Torr. Bot. Club 57 (1940) 289.

In 1947, Baldwin and Schultes (loc. cit. 348) stated: "The presence of a definite caruncle on the seed of this concept renders its inclusion in *Cunuria* untenable." At that time, however, no transfer was made, even though it was recognized that all concepts which fell into the then apparently clear-cut genus *Micrandra* were carunculate and that all which could be included in *Cunuria* were without this structure on the seed. Baldwin and Schultes, therefore, considered the presence or absence of a caruncle to be a character of value in distinguishing between the two genera, although former students of these groups had not mentioned the caruncle. Studies of additional material and the discovery of two new species, however, indicate that, like all other characters once used to separate *Cunuria* from *Micrandra*, the presence or absence of a caruncle is not stable.

The presence of leaf pubescence was not known in the

concepts formerly accommodated in the genus *Cunuria*, whereas a tendency towards some form of pilosity on the under surface of the leaf was in evidence in most of the species hitherto included in *Micrandra*. The concept described by Croizat as *Cunuria Gleasoniana* has a thick, soft indument on the entire under surface of the leaf. This character, alone, would have suggested that the concept should represent a *Micrandra*.

Micrandra Lopezii *R. E. Schultes sp. nov.*

Arbor monoecia, usque ad 65 pedes alta (sed vulgo minor), usque ad 10–12 poll. in diametro (maxima pro parte multo minor), columnaris, vulgo sine radicibus tabularibus; tenuissimo cum cortice cinereo vel in partibus altioribus brunneo, 2–3 mm. crasso; succo pro genere copioso lacteo albo. Folia valdissime coriacea, perfecte ovata vel elliptico-rotundata, reclinata, nervum centralem versus angulo 120° plicata, omnino glaberrima, in specimine typico statu adulto 13–25 cm. longa, 10–15 cm. lata (maxima pro parte majora), apice valde rotundata, basi cordata, valde marginata, supra glauco-atroviridia (siccitate fusco-straminea), infra pallidiora; venis secundariis 12–14, in sicco stramineis, subtus non elevatis, superficie inferiore valde elevatis, arcuato-adscendentibus, sub marginem ipsum tenuiter anastomosantibus, tertiis prominentioribus reticulatis, subparallelis. Petiolus crassus, siccitate striato-fibrosus, 3–7 cm. longus, 2–3 mm. in diametro; glandulis comparate magnis. Inflorescentiae apicales, dense glomeratae, pedicellis brevissimis, complanatis, crassis, adpresso-tomentellis, vulgo cum flore terminali pistillato magno latere utroque cum floribus duobus vel tribus lateralibus minutis staminiferis omnibus in bracteis ovatis caducis septis cincto. Flores pallide luteo-virides vel flavi, leviter aromatici. Flores pistillati calycis laciniis quinque, imbricatis, carnoso-

crassissimis, elongato-ovatis, 7 mm. longis, 3 mm. latis, omnino dense et minute albo-tomentellis. Discus hypogynus, cupuliformis, glanduloso-lobatus, lobis longe triangulari-subulatis, 0.8 mm. ad 1 mm. longis, flavis. Ovarium ovoideum, in circuitu aliquid trigonum, 1.2–1.8 mm. in diametro, glabrum; stylus subsessilis, niger, carnosus, tripartitus cum divisionibus bifidis, reflexis, 1.2 mm. longis, supra glabris, subtus dense albo-tomentellis. Flores staminiferi multo minores, 1.3 mm. in diametro, semper ad florem pistillatum stricte adpressi et itaque valde deformati; calycis laciniae illis florum pistillatorum similes sed minores. Discus nullus. Stamina sex ad novem, valde minuta, usque ad 0.8 ad 1 mm. longa vel saepe breviora, valde deflexa, filamentis liberis inaequalibus et antheris aliquid pyramidalibus. Fructus ellipsoideus, atroviridis, apice rotundatus, leviter trisulcatus, vivo 33 mm. ×28 mm., siccitate 28 mm. ×24 mm., epicarpio glabro, 2–3 mm. crasso; valvis partientibus non contortis; pedunculo probabiliter robustiore. Semina adhuc ignota sed probabiliter pro genere parva.

Brazil: Estado do Amazonas, Rio Uaupés, at base of Serra Tukano (on right bank below mouth of Rio Tikié). "Small tree, columnar and not buttressed, 45 feet tall, 7–10 inches in diameter. Leaves heavily leathery, marginate, folded at 120° angle along midrib. Bark grey or brownish red above, hard and brittle, thin, checked; internally red. Flowers white, odorless. Latex thick, white, sticky, not coagulating easily. In caatinga-forest." February 8, 1948, *Richard Evans Schultes & Francisco López 9725* (Type in Herb. Gray).—Same locality. "Small tree in caatinga-forest. Columnar, not buttressed, 50 ft. tall, diameter 8 inches. Bark checked, grey or reddish brown above, hard, thin, peeling from cambium freely; red internally. Leaves coriaceous, marginate, folded along midrib forming an angle of 120°. Latex thick, white, sticky, not coagulating easily, relatively abundant. Growing very abundantly together with *Hevea nitida* and *H. pauciflora*. Wood white, relatively hard." November 7, 1947, *Richard Evans Schultes & João Murça Pires 8999*.—Same locality and date. "Columnar tree 65 ft. tall, diameter 10–12 inches, not buttressed. Latex fairly abundant, white, sticky, not coagulating easily. Bark smooth, reddish brown outside, red inside, thin. Leaves coriaceous, marginate, folded

along midrib, reclinate." *Richard Evans Schultes & João Murça Pires 9000.*—Same locality. January 30, 1948, *Richard Evans Schultes & Francisco López 9663, 9664.*—Estado do Amazonas, Rio Uaupés, Ipanoré. February 2, 1948, *Richard Evans Schultes & Francisco López 9666, 9667, 9669.*

Micrandra Lopezii appears to approach most closely to *M. glabra*, a tree of savannas or caatingas in British and Dutch Guiana. Whereas the latter is a corpulent, heavily buttressed tree, the former is a slender tree devoid of buttresses (except in the *forma* described below). The leaves of *Micrandra glabra* tend, in general, to be somewhat smaller than those of *M. Lopezii*, and they also seem to have had in life a waxy glaucescence on the upper surface, a character not present in *M. Lopezii*. The fruit of *Micrandra Lopezii* is much smaller (33×28 mm.) than that of *M. glabra* (55–60 mm. ×30 mm.), and the capsule of the former is perfectly rounded at the apex, whereas that of the latter tends to be somewhat tapering. The staminate flowers of *Micrandra Lopezii* are very minute, only 1.3 mm. in diameter, much smaller than those of *M. glabra;* and the pistillate flowers, while of about the same size, have differentiating characters in the disk. *Micrandra Lopezii* has an extremely dense and contracted axillary inflorescence, whereas that of *M. glabra* is lax with rigid pedicels and is subapical.

Micrandra Lopezii is an inhabitant of the caatinga-forest formation of the upper Rio Negro basin. Its similarity to *Micrandra glabra* emphasizes once more the phytogeographical relationship of the upper Rio Negro with the Venezuelan-Guianan land mass. We might justifiably infer, from its relationships and the isolated occurrence of *Micrandra Lopezii* near bases of ancient remnant mountains, that this species represents one of the most ancient elements of the genus.

Be that as it may, there is no doubt that *Micrandra*

Lopezii stands entirely alone as the most primitive member of the genus. Examination of ample material has disclosed the most extraordinary lack of differentiation which, combined with other factors of morphology and phytogeography, I can interpret to mean only that we are confronted with the most primitive species yet known in the group.

Usually, in *Micrandra*, the large terminal flower is pistillate, whereas the smaller laterally placed flowers are staminate. Furthermore, any condition suggestive of a perfect flower in this group of plants has been completely unknown.

The curious structure of the densely glomerate inflorescence in *Micrandra Lopezii* is matched in significance only by the unexpected lack of differentiation of the flowers. The large terminal flower is usually pistillate, but may be staminate; rather frequently, it is found to be perfect, with anthers full of pollen grains, which would suggest that the flower is functionally as well as morphologically perfect. From six to nine stamens may be present. There are, likewise, transitions from perfect to purely pistillate terminal flowers. The anomalous formation of the stamen-filaments is probably significant, emphasizing in a striking manner the lack of differentiation of floral parts. Some of the filaments seem to arise from the disk, while a few appear to grow from within the disk and a few from without this structure. In some of the transitions from perfect to pistillate flowers, these "filaments" lack anthers and, were their position on the disk constant, could be taken for long, subulate lobes of this structure.

The large terminal flower is flanked by several (usually two or three) smaller flowers. As in the terminal flower, these laterals may be pistillate or even perfect, although they usually are staminate. There may even be

additional buds at the base of these smaller, lateral flowers, but they seem rarely to develop. It is obvious from this condition that, however densely glomerate it may appear to be, the inflorescence of *Micrandra Lopezii* is of indeterminate growth. These lateral flanking flowers so tightly enclasp the larger terminal flower that they are flattened and distorted. They may be of unequal size and are enclosed in large, ovate, caducous bracts.

The staminate flowers are variable both in size and in number of stamens. The usual number seems to be eight, but a variation from six to nine exists. The staminate flowers usually have a hairy, lobate disk.

This extraordinary display of protean versatility on the part of the flowers of *Micrandra Lopezii* may be of much deeper significance than we can now understand. The genera of the *Euphorbiaceae* are usually well defined and stable. The discovery of such an apparent lack of differentiation in generic characters is indeed unexpected.

On a basis of most of its characters, the concept here described as *Micrandra Lopezii* would have been accommodated by the genus *Cunuria*. The species, however, has two characters which would have thrown it into *Micrandra* as formerly delineated. The presence of a disk in the staminate flower and the low and inconstant number of stamens are "micrandroid" characters; whereas *Cunuria* was, in great measure, based upon an absence of a staminate disk and a constant presence of ten stamens. Therefore, since *Micrandra Lopezii* is intermediate between *Cunuria* and *Micrandra* as formerly understood, it can be taken as a partial basis for the reduction to synonymy of *Cunuria* herein proposed.

This most unusual tree I am dedicating to the late Francisco López who first discovered it and recognized it as a "different" *cunurí*. "Pacho" López was born in La Pedrera in the Colombian Amazonia in 1927 and died

in Bogotá on July 6, 1949. During his five years as assistant collector with me, his work, always cheerful, enthusiastic and loyal, added much to our knowledge of the Amazon flora of his country.

In November 1947, Murça Pires, López and I went up the Rio Uaupés to investigate the caatinga flora at Ipanoré, Spruce's type locality ["Panuré"], of *Hevea rigidifolia* and many other remarkable endemics. On this trip, our attention was arrested one day by the sudden appearance on the right bank of a small, bald granitic mountain (Serra Tukano), a few kilometers in from the bank, near the almost-abandoned settlement of Bela Vista, about midway between the mouth of the Rio Tikié and the confluence of the Rios Uaupés and Negro. Knowing that such mountains are often repositories of botanical treasures, we stopped and began to slash our way through the forest towards the base of the mountain. Near the base we emerged into a most beautiful and fascinating caatinga-forest. While Murça Pires began to collect the general flora, López and I concentrated on *Hevea* and *Micrandra*. We were hoping for some interesting individuals of these laticiferous trees, but we were not prepared for the pleasant surprise which was in store. Rapid scouting of the caatinga convinced us that we were in an almost pure stand of a slender, columnar and unbuttressed species of *Micrandra*. The curious, dry, thickly coriaceous leaves of the tree, which had first commanded our attention, thickly covered the floor of the caatinga where they are strewn each year. Walking over them causes a very sharp crunch because of the thickness of the carpet.

Careful search showed that no trees were in flower. One individual in sporadic and probably abnormal fruit was collected. On our return in late November, we revisited the locality, making a more detailed, but unsuc-

cessful search. In late January, however, López and I again penetrated to the base of Serra Tukano and were rewarded with flowering material. It happened to be the height of the flowering period, and a century set was made of one tree which was abundantly blossoming. It is significant to note in passing that, although the flowers of *Micrandra Lopezii* have no odor perceptible to man, the trees, when in blossom, are frequented by literally thousands of large, black, stinging bees or wasps. Although we felled trees to collect material, the persistence of these insects made the task extremely unpleasant.

In February, we found *Micrandra Lopezii* in the caatinga at Ipanoré, farther upstream from Serra Tukano.

Micrandra Lopezii forma **anteridifera** *R. E. Schultes forma nova.*

Arbor usque ad septuaginta pedes alta, a *Micrandra Lopezii* trunco 18 poll. in diametro ad basim radicibus tabularibus late hebetato-rotundatis crassis sed non extensis usque ad quattuor pedes altis armato, cortice grossiuscule squamoso et foliis paulo coriaceoribus differt.

Brazil: Estado do Amazonas, Río Curicuriarí, at base of Serra Cujubí. "Flowers yellow. Tree 70 feet tall, 1½ ft. in diameter, columnar above, slight rounded buttresses up to 4 feet. Bark very thick (½ inch), reddish inside, reddish brown outside, rather shaggy, soft, peeling easily. Crown small. Leaves highly coriaceous, marginate, folded along midrib at a right angle. Latex sparse, thick, white, sticky, not coagulating well." January 22, 1948, *Richard Evans Schultes & Francisco López 9637* (Type in Herb. Gray); *9638*.

Micrandra Lopezii forma *anteridifera* differs from *M. Lopezii* in having low, bluntly rounded buttress-roots up to a height of about four feet and in having a much thicker bark which is very coarsely shaggy. These two characters are extremely constant in the colony of trees at the base of Serra Cujubí, where we examined more than eighty individuals. The lack of any slight indication

of buttressing is equally as constant in *Micrandra Lopezii*, for at least 175 individuals were examined in the two localities known for the plant without our finding a single buttressed individual. Special attention was devoted to this study, since buttressing is such a fundamental character in *Micrandra*. The rounded, thick nature of the buttresses of *Micrandra Lopezii* forma *anteridifera* is unlike that in any other concept of the genus. Buttresses in *Micrandra* are either usually rather thin and sharp, extending outwards from the trunk enormously (as in *M. Spruceana*) or becoming stilt-like (as in *M. crassipes*). The epithet *anteridifera* refers to the presence of buttress-roots on this form of *Micrandra Lopezii*.

Our trip to the headwaters of the Rio Curicuriarí was made expressly to study the representatives of *Hevea* and *Micrandra* in that most fascinating of rivers. We continued upstream as far as the Serra Cujubí, a small mountain located not far southeast of Serra Tukano, partly to ascertain if *Micrandra Lopezii* crossed over from the Uaupés to the Curicuriarí drainage-area by way of these granitic hills and their attendant caatinga-forests. It is, I think, highly significant that the new species and its form should be so restricted to the Uaupés and upper Curicuriarí. One whole year in the upper Rio Negro basin failed to uncover other localities for the *M. Lopezii* concept. There can be little doubt but that other localities (the concept is always found in small, isolated colonies) do exist, but we may venture to say that they are not numerous and are not far from the focus comprised between the Uaupés and the Curicuriarí.

Micrandra Rossiana *R. E. Schultes sp. nov.*

Arbor monoecia, usque ad septuaginta pedes alta (saepe multo minor), usque ad decem vel duodecim pollices in diametro; truncus erectus et columnaris, sine

radicibus tabularibus, cum cortice laevi, tenui, mollissimo, extus flavo-fulvo, intus subalbido; succo sparsissimo lacteo-albo. Folia firme chartacea vel subcoriacea, statu juvenili elliptica, statu adulto 12 24 (plerumque plus-minusve 14) cm. longa, 6-11 (plerumque 6.5) cm. lata, margine integra, leviter et inconspicue marginata, apice abrupte apiculata, basi vulgo late cuneata vel raro subrotundata, longe petiolata (petiolo 2 4.5 cm. longo, 1–2 mm. in diametro, laminae junctionem versus carnoso-dilatato et biglanduloso, glandulis nigris), vivo supra atroviridia, nitida, venis potius elevatis stramineis, subtus pallidiora, venis omnibus stramineis valdissime elevatis, in nervorum centralium et secundariorum angulo axillari dense albido- vel stramineo-pilosa. Inflorescentiae axillares, rigidae, pauciflorae, plerumque 6 10 cm. longae, rhachide obscure et irregulariter cinereo-pulverulenta, cortice rufo. Bracteae flores subtendentes acuto-subulatae, 2 mm. longae, dense pulverulentae; bracteolae similes, multo minores. Flores pistillati comparate magni, apice usque ad 9 mm. in diametro, flavi, calyces 6 mm. longi, extus minute pilosi, apicem versus dense albido-pulverulenti, intus dense pilosi pilis retrorsis, laciniis ovatis, apice rotundatis, margine integris, carnosis, 4 mm. longis, 3 mm. latis; discus hypogynus, parvus, annularis, margine sanguineus, ad ovarium adnatus, intus cum sex ad decem projectionibus minutissimis (0.3 ad 0.5 mm. longis) aliquando capitatis quasi staminodiis, albis (staminibus rudimentariis?); ovarium late pyramidali-ovoideum, 3.5 mm. altum, basi 2.5 mm. in diametro, densissime pilosum; stylus subsessilis, tripartitus cum divisionibus bifidis, crassus, reflexus. Flores staminales in alabastro subglobosi, minuti, circiter 1–1.5 mm. in diametro; calyce florum pistillatorum simili sed minore et laciniis haud aperientibus; stamina octo, quinque cum filamentis longis (0.8 mm.) et tria cum filamentis brevibus (0.3 mm.),

omnibus congesto-deflexis, antheris comparate magnis, circiter 0.6 mm. longis; ovarii rudimentum conspicuum, dense villosum; discus nullus. Fructus conspicue ellipsoideus, vivo plusminusve 4 cm. longus, 2–2.2 cm. in diametro, siccitate haud minor, apice rotundato-obtusus, basi aliquid indentatus, in circuitu suborbicularis, epicarpio nitido, atroviridi sed maturitate flavescenti, magnopere tenuissimo (vivo saepissime quam 0.8 mm. minore), endocarpio lignoso, tenui (usque ad 1.2 mm. crasso), valvis regularibus, 2.5 cm. longis, 6 mm. latis; pedunculo vulgo longissimo, gracili, usque ad 5.5 cm. longo, 1–1.2 mm. in diametro. Semina carunculata (caruncula magna, 4–4.5 mm. lata), testa rufo-brunnea, in circuitu longitudinali ovalis, 22 mm. longa, 12 mm. lata, valde compressa, 8 mm. crassa, in circuitu transversali inaequaliter rhomboidea, superficiebus duabus ventralibus conspicuis, carina dorsali conspicua.

BRAZIL: Estado do Amazonas, Rio Uaupés, between Ipanoré and confluence with Rio Negro, Igarapé da Chuva, Taraquá. "Medium-sized tree, 70 ft. tall. Columnar, 10–12 inches diameter, not buttressed. Latex very scant, thick, white. Bark smooth, thin, soft, externally yellowish, internally white. Flowers yellow. Fruits ripening yellow. Leaves chartaceous." November 12, 1947, *Richard Evans Schultes & João Murça Pires 9058* (TYPE in Herb. Gray).—Estado do Amazonas, Rio Amazonas, Tonantíns. "Mata da terra firme ao longo d'um riachinho. Árvore grande. Flôr crême. Latex escasso." February 10, 1944, *Adolpho Ducke 1560*.—Estado do Amazonas, Rio Uaupés, Igarapé da Chuva, Taracuá. "Tree 70–75 feet tall, 18 inches in diameter; trunk columnar, without buttresses. Bark thin, $\frac{1}{2}$ cm. peeling easily from the cambium, externally perfectly smooth, yellowish, inside whitish, soft. Latex extremely sparse, white. Crown rather extensive, spreading. Leaves chartaceous, not folded along midrib. Flowers cream-white, odorless. Tukano name: *bõ-wá-puch*. Fruit ripens yellow from tip to petiole, subtriangular in cross section, ellipsoid, valves coming together with definite ridge or keel-effect, apex strong obtuse often even indented, base strongly indented; epicarp smooth, glabrous, very thin (0.25 mm.)." November 12, 1947, *Richard Evans Schultes & João Murça Pires 9048*.—Same locality and date. "Tree 60–70 feet tall, columnar, 1 foot in diameter. Bark thin, soft, smooth, externally yellowish, internally white. Latex white, extremely thick

and unusually sparse, coagulating easily to relatively elastic gum. No buttressed roots. Growing in light forest on white sand near rills. *Arara-seringa.*'' *Richard Evans Schultes & João Murça Pires 9050.*—Same locality and date. ''Columnar, non-buttressed tree 65–75 feet tall, 1 foot in diameter. Bark thin, soft, outside light yellowish tan, inside white. Latex very sparse, white, thick. *Arara-seringa da terra firme.*'' *Richard Evans Schultes & João Murça Pires 9064.*—Same locality and date. ''Árvore de 15 m.; tronco cilindrico, sapopema muito pequena; casca externa marron clara com leve escamação; latex escasso; flôr branca na ponta dos galhos. Vive na caatinga juntamente com *Cunuria Spruceana*, *C. crassipes*, *Eperua purpurea*, *E. leucantha*, *Monopteryx Uaucu* etc.'' *João Murça Pires 971.*—Same locality. ''Fruit green, turning yellow. Columnar tree with yellowish, smooth, thin bark. Latex sparse, white.'' February 3–6, 1948, *Richard Evans Schultes & Francisco López 9681.*—Same locality and date. ''Columnar tree 70 ft. tall. Latex thick, white, sparse. Flowers yellow.'' *Richard Evans Schultes & Francisco López 9693.*—Same locality and date. ''Latex white, sparse. Crown heavy. Flowers whitish cream. Columnar tree 60 ft. tall.'' *Richard Evans Schultes & Francisco López 9694.*—Same locality and date. ''Columnar, unbuttressed tree 70 ft. tall. Bark smooth, yellowish. Latex white. Fruit green. *Arara-seringa.*'' *Richard Evans Schultes & Francisco López 9695.*—Rio Taraíra basin, headwaters of Igarapé Abiú. July 7, 1948, *Richard Evans Schultes 10199A.*

COLOMBIA: Comisaría del Vaupés, vicinity of Montfort Mission, Río Papurí. Alt. about 200 m. ''Slender, infrequent trees averaging 25–30 m. in height and 50 cm. in diameter. Trunk not buttressed. Bark grey, thin and hard, and difficult to tap. Latex very scanty, coagulating to a gummy, non-elastic mass. Small, trispermate capsules, resembling those of *arara-seringa*, *Micrandra siphonioides*, but considerably elongated. Not well known, one or two individuals hesitatingly called them either *mahawakpuh* or *buhuwakpuh*, but it is doubtful if either would be generally recognized as applicable to this species.'' August 28, 1943, *Paul H. Allen 3109.*—Comisaría del Vaupés, Río Negro, San Felipe (opposite San Carlos, below Guainía-Casiquiare confluence). ''Columnar tree about 60 feet tall. Bark rather yellow-brown, thin, smooth. Latex thick, white, sparse. No buttresses. In light caatinga-forest.'' June 1948, *Richard Evans Schultes & Francisco López 10034.*—Comisaría del Vaupés, Rio Taraíra, above lowest rapids. July 11, 1948, *Richard Evans Schultes 10203A.*

VENEZUELA: Territorio del Amazonas, Río Negro, San Carlos. ''Corpulent tree, columnar, 70 feet tall, in light caatinga-forest near brooklet. Bark smooth, tawny brown or yellow. Latex not abundant, white.'' *Richard Evans Schultes & Francisco López 10033.*

My good friends, the Rev. Mr. and Mrs. William Arlie Ross have devoted their almost limitless energies and enthusiasm for over fifteen years to educational and missionary work amongst the poor inhabitants of the upper Rio Negro. Their home and school, located at Jucabí at the mouth of the Rio Curicuriarí, has always been open to travellers and scientists. In gratitude for their kindnesses and help during my explorations in 1947–48 and in respect for their self-sacrificing spirit, I have taken the liberty of naming this most extraordinary tree in their honor.

Several years ago, I prepared a manuscript synopsis of the genus *Micrandra* as known from the then available herbarium material, which was not extensive. Because of pending field work which offered an opportunity of visiting the type localities of several of the concepts, this manuscript was not published. During the preparation of the synopsis, I examined specimens of *Ducke 1560*, which had been filed in our herbaria as *Micrandra siphonioides* Benth. Impressed with the clear differences between the capsule of *Ducke 1560* and that of true *Micrandra siphonioides*, I drew up a description of the Ducke collection as an undescribed species of *Micrandra* and annotated the sheets with a new binomial referring to the elongate shape of the fruit. There were also differences in the leaves, and these differences enabled me to annotate the sterile collection *Allen 3109* with the same name. There was never the slightest doubt in my mind that the specimens belonged in the genus *Micrandra*, even though flowering material was not available.

During my year's sojourn in the upper Rio Negro basin in 1947–48, it was possible to collect, from several widely separated localities, very abundant material of this concept in flower and in fruit. I happened upon the first tree by noticing the very coriaceous leaves scattered

on the floor of the forest in great abundance. An investigation showed that the tree was of medium size, with a perfectly columnar, unbuttressed trunk which was covered with a smooth bark of a yellowish hue—all characters unusual indeed in *Cunuria* and *Micrandra* as the genera have hitherto been understood. Flowers and ripened fruit were found on the same tree. A hasty examination in the field indicated that, although there were definite characters of the leaves and fruit which would throw it into *Micrandra*, the external structure of the flowers and the overall appearance of the inflorescence strongly suggested *Cunuria*. Until a recent opportunity of examining the flowers microscopically, I was puzzled as to which genus it rightly belonged. Indeed, even during my field work, I felt that the intermediate position of this concept might perhaps necessitate our reduction of *Cunuria* to synonymy under *Micrandra*.

Detailed microscopic studies of *Micrandra Rossiana* have convinced me that the characters used to separate *Cunuria* from *Micrandra* do not hold. It was this discovery, supported by additional evidence from other species, which led to the reduction proposed in this paper.

The leaf of *Micrandra Rossiana* suggests that of *Micrandra siphonioides* in size, texture and shape. The presence on the under surface of the leaf of dense tufts of hair in the axils of the secondary veins with the central nerve is a character possessed by several species of *Micrandra*, but unknown in *Cunuria*. The capsule, especially its very thin epicarp, would fall into what has been considered *Micrandra* and not into *Cunuria*. The carunculate seed suggests *Micrandra*. The gross structure of the flowers is very definitely "cunurioid," with a deep cup-shaped calyx split into lobes for only about one third of its length, as opposed to the "micrandroid" calyx which is split nearly to the base with the lobes expanded

and retrorse. The other floral characters, however, would agree with *Micrandra* as originally understood: a lobate disk in the staminate flower and a thin annular disk in the pistillate flower. The staminate flower has eight stamens, which is rather intermediate between the two generic concepts.

It is obvious from all of the foregoing considerations that *Micrandra Rossiana* is truly an intermediate concept and that the characters upon which *Cunuria* has rested are unstable.

Micrandra Rossiana appears to be without close allies amongst the known species of the genus.

Micrandra Spruceana (*Baillon*) *R. E. Schultes comb. nov.*

Cunuria Spruceana Baillon in Adansonia 4 (1864) 288.

"*Micrandra et Pogonophora ? Cunuri* H. Bn. ol. in exs. Spruce" in Adansonia 4 (1864) 288.

Micrandra Cunuri Baillon ex Mueller-Argoviensis in DC. Prodr. 15, pt. 2 (1866) 1123.

Pogonophora Cunuri Baillon ex Mueller-Argoviensis in DC. Prodr. 15, pt. 2 (1866) 1124.

Cunuria bracteosa Ducke in Notizbl. Bot. Gart. Berlin 11 (1932) 586, in synon.; in Arch. Jard. Bot. Rio Janeiro 6 (1933) 57.

Cunuria Spruceana Baillon var. *bracteosa* (Ducke) R. E. Schultes ex Baldwin & Schultes in Bot. Mus. Leafl. Harvard Univ. 12 (1947) 345, t. 46.

It is unfortunate that the International Rules of Botanical Nomenclature will not permit the adoption of the binomial *Micrandra Cunuri*, which would have avoided the use in the same genus of the genitive (see below under *M. Spruceï*) and adjectival forms of the same epithet. There is no possibility of taking up *Micrandra Cunuri*, however, and the new combination made above is necessitated.

On the evidence from the collections available in 1947, it seemed advisable to recognize Ducke's *Cunuria bracteosa* as a variety of *Cunuria Spruceana*, although Ducke himself (loc. cit.) had reduced it to synonymy under *C. Spruceana*. Examination of many hundreds of trees in the Rio Negro and its tributaries, the Río Caquetá and the Río Amazonas leads me to conclude that the characters upon which the variety were based are, in general, variations of a seasonal nature. The variety, in consequence, is herewith reduced to synonymy.

Micrandra Sprucei (*Muell.-Arg.*) *R. E. Schultes comb. nov.*

Clusiophyllum Sprucei Mueller-Argoviensis in Flora 57 (1864) 518.

Cunuria crassipes Mueller-Argoviensis in Martius Fl. Bras. 11, pt. 2 (1874) 510.

In Baldwin and Schultes' treatment of *Cunuria* in 1947, an argument was advanced for the retention of the well established and very descriptive name *C. crassipes* (loc. cit. 338): ". . . . *Cunuria crassipes* is being conserved, in conformity with Recommendation XIV of the International Rules of Botanical Nomenclature, over the earlier *Clusiophyllum Sprucei*. Were the indicated combination to be made, a new name would enter into the taxonomic literature. This name would be unfortunate because of its resemblance to *Cunuria Spruceana*, and endless confusion would be the result."

I had interpreted the wording of Recommendation XIV to permit this action. Since 1947, however, I have had an opportunity of discussing the problem with many American and European colleagues. They are in almost unanimous agreement that the rule of priority should take precedence over the recommendation advising against "the use in the same genus" of the genitive or

adjectival form of the same epithet to designate two different species. In view of this interpretation, I am reluctantly making the indicated new combination. I am certain that only confusion can come from having, in such a small genus, two different species growing in the same geographical area—indeed, sometimes in close association with each other—with the names *Micrandra Spruceana* and *M. Sprucei*. Although the situation created is an absurdity, I am sure that the greatest overall good in systematic botany will result from a strict adherence to the Rules rather than from a surrender to personal preference.

The type collection of *Micrandra Sprucei* did not have abundant flowering material. None of the collections made since Spruce's expedition and cited by Baldwin and Schultes (loc. cit. 336) were in flower. Consequently, the only available description of the floral parts of this species was extremely inadequate. I quote from Pax's treatment in Pflanzenr. IV, 147 (1910) 17: "Flores ♂ aperientes ovoidei, 3 mm. longi, in cymulis fere sessiles, tantum pro 2/5 5-fidi." There is no description at all of the pistillate flower.

In the course of my field work in the upper Rio Negro basin, a large number of flowering collections of *Micrandra Sprucei* were made. Additional evidence that the generic characters of *Cunuria* are not stable is provided by the flowers of *Micrandra Sprucei*. The staminate flowers of this species have seven stamens and an extraordinarily distinct glandular-lobate disk which is such a bright scarlet that it may be seen in life through the pale yellow calyx. These are characters formerly attributed to *Micrandra*, while *Cunuria* was based, in great part, upon ten stamens and an absence of the staminate disk. In addition to dried herbarium specimens, abundant material of the inflorescences was preserved in alcohol;

this preservation precluded any alteration of floral parts due to pressing, drying and subsequent boiling in water. The following description of the flowers is based upon the topotypical collection *Schultes & López 9884:*

Inflorescentiae axillares, folia aequantes vel paulo breviores, leviter flexibiles, rhachidibus robustis, usque ad 2.2 mm. in diametro, glabris, flavo-viridibus. Flores pistillati terminales, pallide flavi sed basi sanguinei (propter intus disci colorem naturum pellucidum), cupuliformes, magni, 7 mm. longi, apice late aperientes, 9 mm. in diametro; bracteis caducis, hyalinis, triangularibus, apice acutis, 3 mm. longis, basi 1.6 mm. latis subtenti. Calyx per 1/3 longitudinis partem quinque-partitus, basi articulatus et in commisura tubuli forma cadentus, lobis valde imbricatis, aliquid carnosiusculis, apice rotundatis, extus maxima pro parte glabris sed apicem versus albido-pulverulentis, intus dense albo-tomentellis. Discus hypogynus, quinque-lobatus, lobis glandulosis, vivo sanguineis, maximo 0.6 mm. $\times$1.5–1.8 mm., crasso-pulviniformibus, lobis utrisque duobus cum laciniis triangulari-subulatis, usque ad 0.8–1 mm. longis. Ovarium ovoideum, lageniforme, perfecte glabrum, nitidum, 2.5 mm. in diametro, 3 mm. longum; stylus carnosus, rufo-brunneus, tripartitus cum divisionibus bifidis, reflexis, usque ad 1 mm. longis. Flores staminiferi minores, 5 5.5 mm. longi, 3 mm. in diametro, elongato-ovoidei. Calyx non late aperiens, per 1/3 longitudinis partem quinque-partitus, lobis illis pistillatorum similibus sed apice aliquid cuculliformibus. Stamina septem, tres 3 mm. longa et quattuor 2 mm. longa, apice deflexo, nutantia, filamentis liberis, glabris, 0.4 mm. in diametro, antheris 0.9 mm. longis, 1 mm. latis. Discus quinque-lobatus, lobis glandulosis, vivo sanguineis, majoribus, 0.6 mm. $\times$0.9 mm., crasso-pulviniformibus.

Venezuela: Territorio del Amazonas, Río Negro, at base of Piedra

del Cocuy. "Tree with small crown; 80 feet tall; columnar; diameter 2 feet. Rather large stilt-buttress roots. Latex thick, white, sparse. Bark thick, $\frac{3}{4}$ inch, rough, externally dark brown, internally reddish, soft. Leaves coriaceous. Flowers yellow-cream, pinkish at base. *Cunurí da caatinga.*" May 9, 1948, *Richard Evans Schultes & Francisco López 9884.*

ILLUSTRATIONS

EXPLANATION OF THE ILLUSTRATION

PLATE LXV. MICRANDRA GLEASONIANA (*Croizat*) *R. E. Schultes.* Branch, one half natural size; seed, natural size. Valves of capsule, natural size.

Drawn by GORDON W. DILLON

Plate LXV

MICRANDRA

Gleasoniana (Croizat) R.E. Schultes

EXPLANATION OF THE ILLUSTRATION

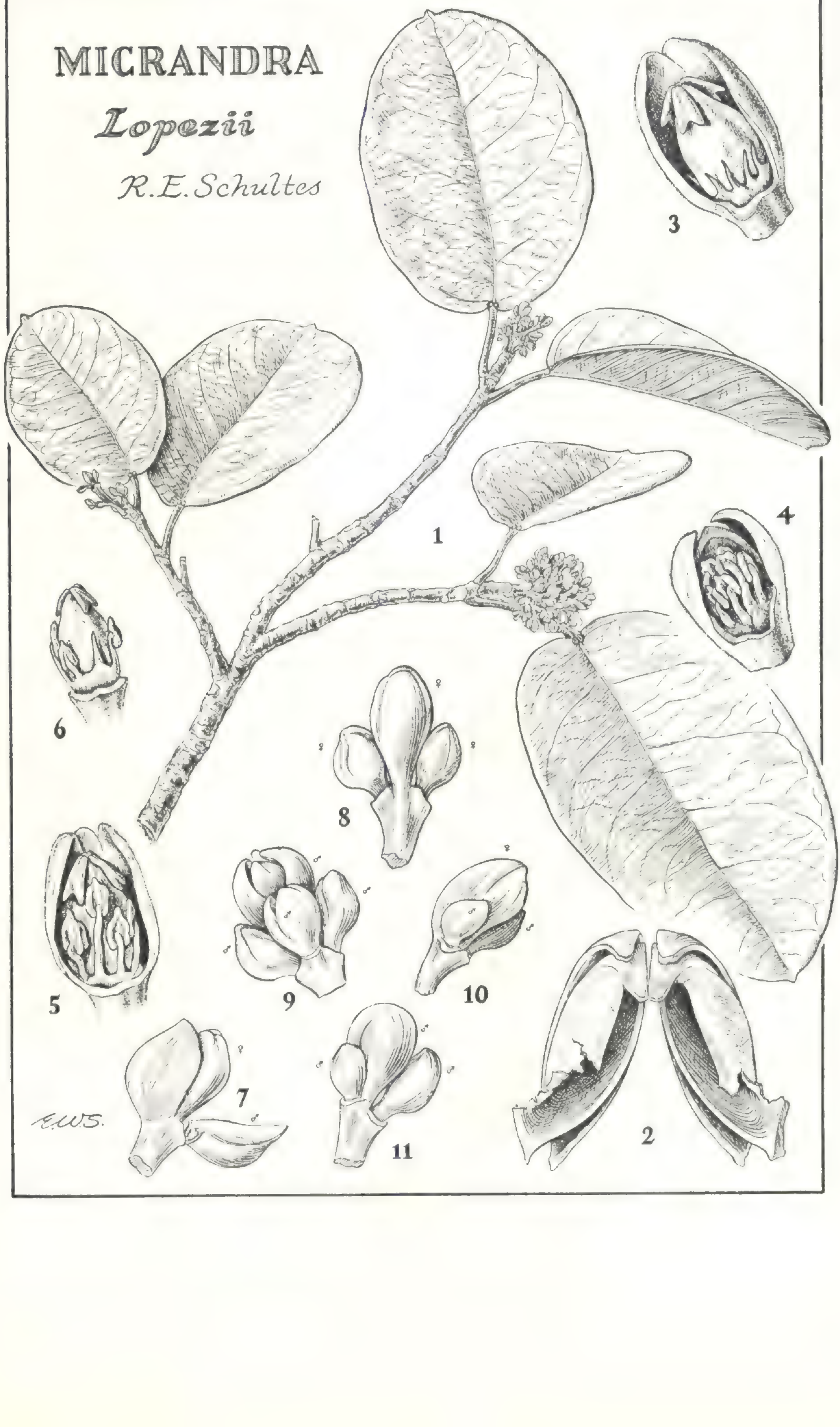
PLATE LXVI. MICRANDRA LOPEZII *R. E. Schultes.* 1, flowering branch, one half natural size. 2, valves of capsule, natural size. 3, pistillate flower, partially dissected, five times natural size. 4, staminate flower, partially dissected, five times natural size. 5, flower, with both stamens and pistils partially dissected, five times natural size. 6, same with calyx removed, five times natural size. 7–11, groups of flowers from an inflorescence showing variation in sexual structure, four times natural size.

Drawn by ELMER W. SMITH

MICRANDRA

Lopezii

R.E. Schultes

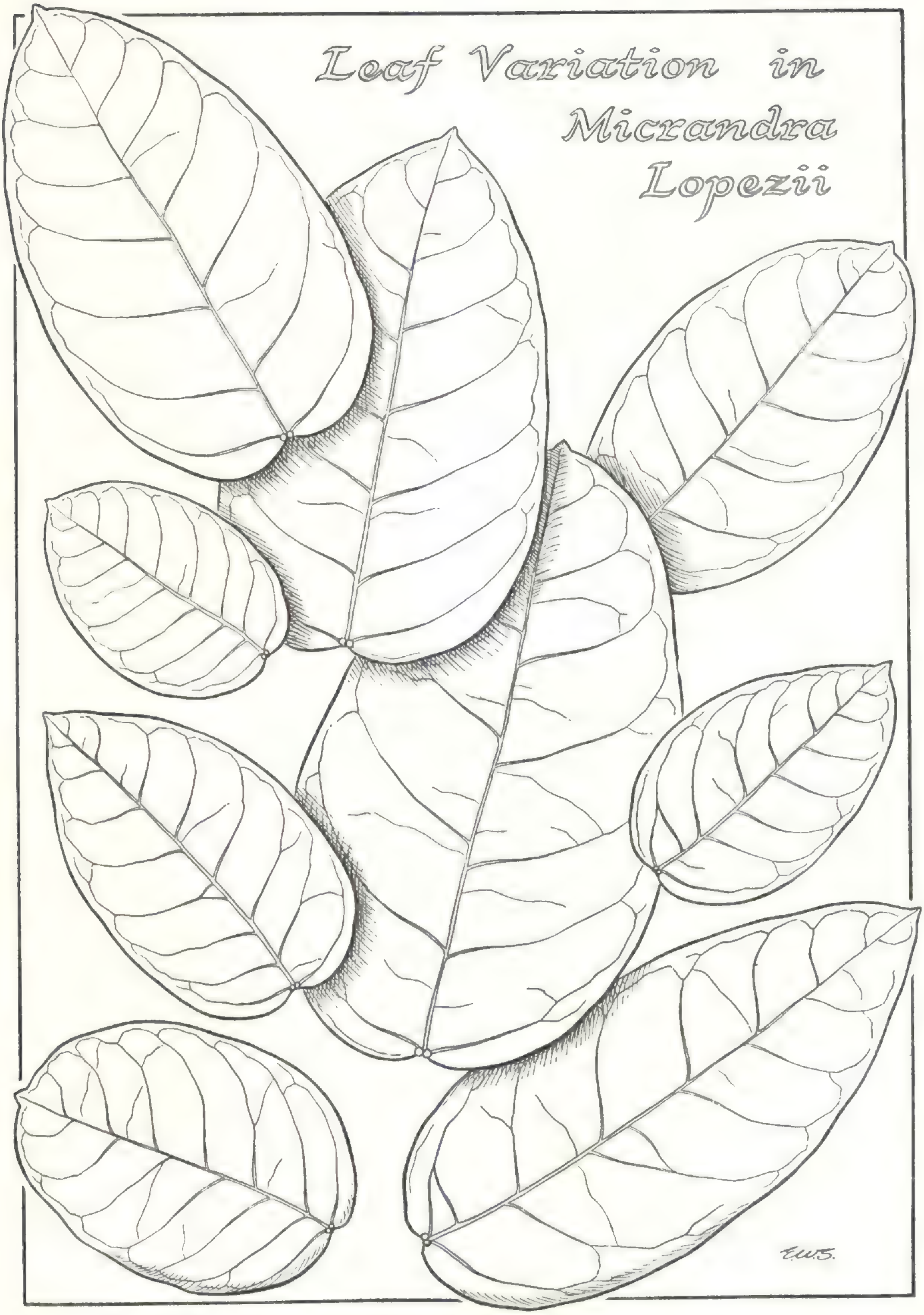


EXPLANATION OF THE ILLUSTRATION

PLATE LXVII. Leaf variation in MICRANDRA LOPEZII, one half natural size.

Drawn by ELMER W. SMITH

Plate LXVII



EXPLANATION OF THE ILLUSTRATION

PLATE LXVIII. MICRANDRA ROSSIANA *R. E. Schultes.* 1, flowering branch, one half natural size. 2, portion of fruiting branch, one half natural size. 3, pistillate flower with part of calyx removed, five times natural size. 4, staminate flower with part of calyx removed, five times natural size. 5, valves of capsule, natural size. 6, seeds, natural size. 7, portion of under surface of leaf showing axillary pilosity, natural size.

Drawn by ELMER W. SMITH

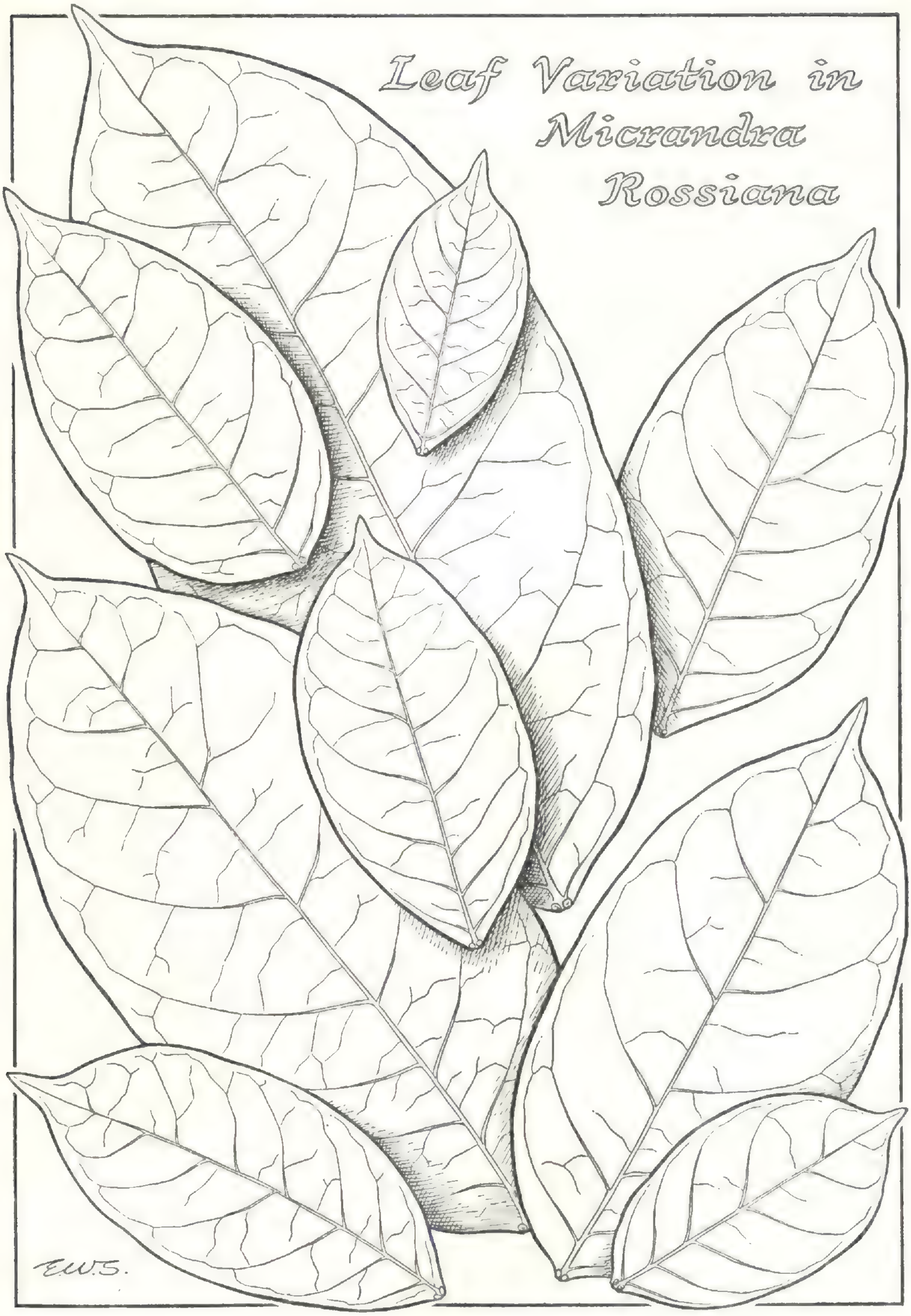
Plate LXVIII

EXPLANATION OF THE ILLUSTRATION

PLATE LXIX. Leaf variation in MICRANDRA ROSSIANA, one half natural size.

Drawn by ELMER W. SMITH

Plate LXIX



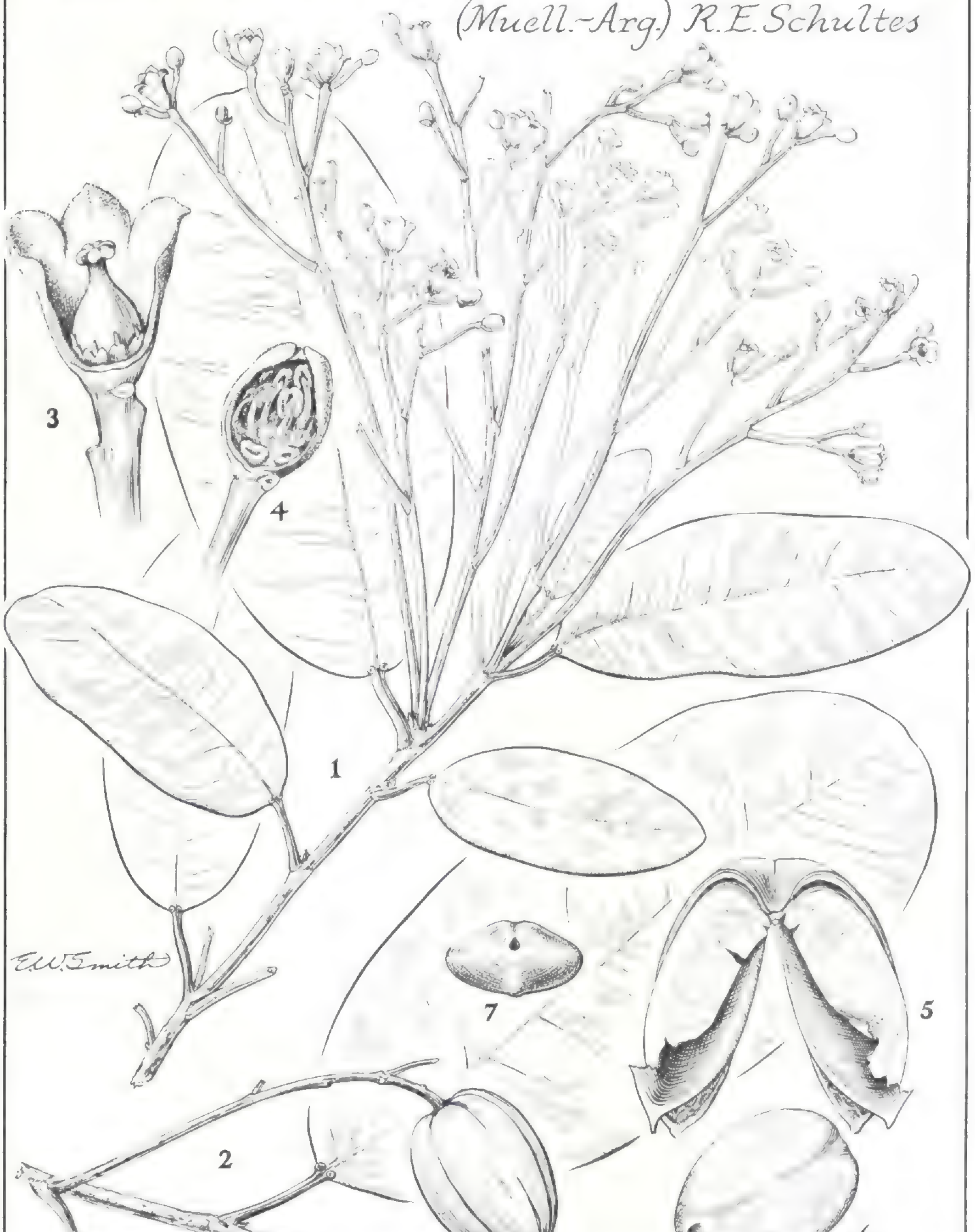
EXPLANATION OF THE ILLUSTRATION

PLATE LXX. MICRANDRA SPRUCEI (*Muell.-Arg.*) *R. E. Schultes.* 1, flowering branch, about one half natural size. 2, portion of fruiting branch, about one half natural size. 3, pistillate flower with part of calyx dissected, three times natural size. 4, staminate flower, with part of calyx dissected, three times natural size. 5, valves of capsule, natural size. 6–7, seeds, natural size.

Drawn by ELMER W. SMITH

MICRANDRA *Sprucei*

(Muell.-Arg.) R.E.Schultes



EXPLANATION OF THE ILLUSTRATION

PLATE LXXI. (Upper figure). Photograph of the stilt roots of MICRANDRA SPRUCEI (*Muell.-Arg.*) *R. E. Schultes.*

(Lower figure). The trunk of the type tree of MICRANDRA LOPEZII *R. E. Schultes* forma ANTERIDIFERA *R. E. Schultes* showing the unusual nature of the buttress roots.

Photographs by RICHARD EVANS SCHULTES

Plate LXXI

EXPLANATION OF THE ILLUSTRATION

PLATE LXXII. Enlarged photograph of the flowers and the branching of the inflorescence axes of MICRANDRA SPRUCEI (*Muell.-Arg.*) *R. E. Schultes.*

Photograph by RICHARD EVANS SCHULTES

Plate LXXII

EXPLANATION OF THE ILLUSTRATION

PLATE LXXIII. Flowering branch of MICRANDRA SPRUCEI (*Muell.-Arg.*) *R. E. Schultes*, showing the structure of the inflorescence.

Photograph by RICHARD EVANS SCHULTES

Plate LXXIII

EXPLANATION OF THE ILLUSTRATION

PLATE LXXIV. Map showing the known distribution of MICRANDRA ROSSIANA *R. E. Schultes*, and M. LOPEZII *R. E. Schultes* with its forma ANTERIDIFERA *R. E. Schultes*.

Drawn by ELMER W. SMITH

THE KNOWN DISTRIBUTION OF
MICRANDRA ROSSIANA
and
MICRANDRA LOPEZII with
its forma
ANTERIDIFERA

KEY:

- △ M. Rossiana
- ○ M. Lopezii
- □ M. Lopezii forma anteridifera

COLOMBIA
VENEZUELA
BRAZIL
PERU
RIO ORINOCO
RIO CASIQUIARE
RIO GUAINIA
RIO ISANA
RIO NEGRO
RIO BRANCO
RIO CAQUETÁ
RIO PUTUMAYO
RIO TONANTÍNS
RIO PAPURÍ
RIO TIKIÉ
RIO UAUPÉS
RIO CURICURIARI
RIO TARAIRA
San Felipe
San Carlos
Ipanoré
Taracuá
Serra Tukano
Serra Cujubí
Tonantíns
Leticia
Manáos
AMAZONAS

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PLANT REMAINS FROM A PERUVIAN MUMMY BUNDLE

BY

MARGARET ASHLEY TOWLE

INTRODUCTION

THE primary purpose of this paper is to describe and identify, whenever possible, the plant remains included in a mummy bundle from Paracas, Peru. A secondary purpose is to compare these specimens with plant materials that have been recovered from other Paracas bundles and described in the literature. The mummy bundle under consideration (cat. no. 38-28-30/4107–4233)[1] was recovered in 1927 from the famous Paracas Necropolis on the southern coast of Peru, and was presented in 1938 to the Peabody Museum of Harvard University by Mr. Nelson Rockefeller. I wish to express my appreciation to Dr. A. V. Kidder II, formerly of the Peabody Museum, for the opportunity of studying the plant remains included in the bundle. I also wish to thank Dr. J. O. Brew, Director of the Peabody Museum, for generously placing at my disposal the manuscript notes and illustrations relative to the bundle itself. Further, I acknowledge with thanks the assistance given me in this study by the members of the staff of the Peabody Museum, the Botanical Museum and the Biological Laboratories of Harvard University.

[1] The catalogue numbers cited are those of the Peabody Museum of Harvard University.

The archaeological site of Paracas is located on the hills and plain of that part of the Peninsula of Paracas that borders the Bay of Independencia. This peninsula is situated on the southern coast of Peru between the valley of the Pisco and the mouth of the Ica rivers, and, like the adjoining mainland, is virtually a desert supporting little or no vegetation. There has been much speculation as to whether or not such an environment could support a permanent population. Nevertheless, two well-defined, although related, cultures have been discovered at this site.

A number of deep burial chambers connected with the surface by shafts were discovered in 1925 on the upper slopes and terraces of the hill designated as "Cerro Colorado" (Tello, 1929; Carrion, 1949). The whole culture represented by these shaft burials is known as "Paracas Cavernas," and the evidence points to it as one of considerable relative antiquity. The second culture at the site of Paracas was first revealed in 1927 with the discovery of the famous Paracas Necropolis (Tello, 1929) located on the lower slopes of this same hill. Within the crude walls of the underground burial chamber, 429 mummy bundles of various sizes, mostly conical in shape, were found. The term "Paracas Necropolis" designates not only this particular site, but also the culture that these bundles and their contents represent. The most outstanding of the latter are the famous Paracas Necropolis textiles.

Most Peruvianists consider Cavernas the older of the two related cultural phases (Kroeber, 1944; Bennett, 1946; Bennett and Bird, 1949; Carrion, 1949). However, the question of chronology must remain open until such time as stratigraphic excavations are made. The area in which these sites are located is not hospitable to human occupation, and some authorities appear to agree

that the presence of so many mummy bundles indicates that they had been brought from elsewhere. However, others (Carrion, 1949) think that the cemeteries, refuse heaps and remains of habitations are evidence for a once flourishing local community that relied upon irrigation to transform this desert into arable land. They believe that the remains of such ditches as were necessary for this type of agriculture lie beneath the shifting sands of the peninsula. But again, this hypothesis may have to be revised as further detailed studies of the area are made.

The mummy bundle at the Peabody Museum illustrates the type of burial practised by the people who interred their dead at the Necropolis of Paracas (Natural History, 41: 119-125; Yacovleff and Muelle, 1934; Tello, 1929; Carrion, 1949). It was customary to place the body in a flexed position with the arms folded on the chest and the knees drawn up nearly to the chin. The body was then wrapped in textiles of varying degrees of elaboration and plain cotton cloth, with the final outer cotton wrapping securely fastened. Included in the bundle, besides textiles of various kinds and uses, were offerings of food, gourd containers which probably held either food or beverages, and other objects of value to the deceased during his lifetime. Many of the objects included in the bundle are of plant origin. In the present paper all vegetal materials found in the Peabody Museum mummy bundle will be considered except textiles. With this exception, the plant remains consist of food, gourd containers, wooden objects, matting and basketry, raw cotton, and several specimens that were either too small or too poorly preserved to be botanically identified. The plant specimens were found in various parts of the bundle, and some of them were undoubtedly in different positions from those that they originally held, due to the natural slumping of the body. The majority of the in-

dividual specimens are fairly well-preserved, which in all probability may be attributed to the arid conditions existing on the peninsula.

A general description of the reconstruction of the mummy bundle, based upon a study of its careful unwrapping with particular emphasis on the plant remains, follows.

Reconstruction of the Mummy Bundle

The unwrapped mummy bundle formed roughly a low cone, smooth in contour except for the projection of the turbanned "head" under the outer wrapping (Plate LXXV). The maximum diameter of the bundle was 1 m.; the maximum height 63.5 cm. The outer wrapping of the whole bundle was a long, plain, warp-faced cotton cloth resembling modern canvas in texture. This had been placed over the bundle, with the free ends of the cloth wrapped spirally from left to right. To facilitate describing the bundle as it was originally constructed, the contents have been arbitrarily divided into four layers which are delimited by the presence of wrappings of plain cotton cloth.

The body had originally been placed in a flexed position, but with the passing of time it had slumped backward with the knees falling to the right. The legs had been tied together by a three-strand fiber braid (30/4160). The arms were still folded and the head faced directly forward. A wad of raw cotton (30/4180) had been placed over the face, and this was held in position by a loosely woven cloth, the ends of which were tied at the back of the head. A head band had been securely wrapped around the forehead. A string of beads and two textiles, one a plain apron, the other a knotted net, were placed about the neck. Fragments of this net were found on the outer surface of part of a large gourd (30/4199) that rested on

the chest of the mummy. A twig wound with cotton thread (30/4161) was enclosed within the folds of these two textiles. Attached to the apron and net at the back of the neck was a small bag of cotton netting containing several pieces of cloth, two smaller nets and a number of fragments of leaves (30/4197).

A shawl had been draped about the body, the ends being brought forward and placed over the gourd on the chest. Inside of a bag which had been placed on top of the shawl was a small knitted bag containing four small bundles of raw cotton wound with cotton string (30/4181). Two of these contained a red pigment; each of the other two a small pellet of oily texture. Various textiles had been wrapped about the upper part of the body, and among these were found a flake of gold and a few kernels of maize (30/4189) which presumably had fallen from the mouth and nose of the mummy. It appears to have been customary to place either kernels of maize, bits of raw cotton or small objects of gold or other material in the mouth or nose of the deceased.

Among the other specimens that had been included in the bundle at this point of its construction were four hanks and four balls of cotton thread. Below the right knee were the much disintegrated remains of a small coiled basket (30/4228). Apparently this basket had originally been placed in the lap of the mummy and had contained, in addition to a fragment of llama wool, a number of plant specimens, probably as a food offering. These comprised remains of peanuts (30/4182), maize (30/4184, 30/4185, 30/4187, 30/4188) and four roots (30/4190, 30/4192, 30/4193, 30/4198).

Several miscellaneous items which presumably had fallen from other parts of the body were discovered at the bottom of the bundle. Among these were a cob of maize (30/4183), another cob with attached kernels

(30/4186), three twigs (30/4194), two seeds (30/4196) and two roots (30/4191, 30/4195). At this point in the preparation of the bundle, two large pieces of plain cotton cloth had been wrapped about the entire body in five layers, and then seamed at the back. This concluded what is considered as Layer I in the construction of the bundle.

Immediately over the plain wrapping that terminated Layer I were several textiles and a woven band that had been placed about the neck of the mummy and knotted in front. Contained in this band were a small gourd (30/4200), a fiber sling with a feather-tuff ornament (30/4170), a miniature feather fan with a fiber handle (30/4178), two shells stuffed with cotton (30/4210, 30/4211) and a number of small objects wrapped in cotton (30/4201) (Plate LXXVI). It appears that at this point in the construction of Layer II, the mummy had been placed in a large basket made for the purpose (30/4227) (Plate LXXV), and several textiles had been stuffed into the container in front of the body. The bundle and the large basket containing it were then wrapped in two plain pieces of cloth that had been sewed together. This terminated Layer II.

Three coarse textiles, which constitute Layer III, were then placed about the bundle. The last of these textiles had been folded and seamed up the side to form a sack. The mummy was placed in this and the slack folds were drawn together and stitched with a coarse thread. The sewing threads met at the top and were wound around the upper edges to form a top-knot. After the sewing of one of the slack seams, the threaded, wooden needle (30/4229) which had been used was left sticking into the folds of the wrapping.

At the beginning of Layer IV a turban was wound about the upper part of the cone to form a "false head,"

the mummy's head now being located well within the present bundle of wrappings. Immediately below this "false head" and covering the lower edge of the turban was a sling (30/4175) (Plate LXXVI), and on the right shoulder a feather fan (30/4179) with a fiber handle resembling the miniature fan that had been included in Layer II. Within the folds of the various textiles that composed Layer IV were two wooden sticks, one a baton of polished wood (30/4231); the other unpolished, but wrapped with sinew about the larger or upper end (30/4230). Finally, the terminal wrapping of coarse, plain cotton cloth was placed about the whole bundle with the ends wrapped spirally from left to right. The bundle now formed a slightly irregular cone (Plate LXXV), smooth in contour except for the projection of the turbanned "head" under the outer wrapping. The completed bundle was lowered into the grave pit and surrounded by a reed mat (30/4226), presumably to protect it from the earth.

This bundle does not differ markedly from others that have been described from this site (Yacovleff and Muelle, 1934; Natural History, 41: 119–125; Carrion, 1949). In fact, there appears to be a certain uniformity, not only in the general construction of the bundles, but in their contents as well. These bundles consist of both plain and elaborately constructed fabrics of various uses, design and color, although the number and quality of the latter type may vary in different bundles. In addition to textiles, there were various objects some of which would appear to have had a ritualistic significance.

Description of the Plant Remains from the Mummy Bundle

From the standpoint of identification, the plant material from archaeological sites in Peru may be divided

into three classes. In the first group are those materials which, because of their structure and composition, have withstood well the ravages of time. One can often determine the genus and in some cases the species to which a specimen in this class belongs from the macroscopic appearance alone. However, there are other specimens which, although well-preserved, are either too small or too lacking in the necessary details to make identification possible.

In the second group occur plant parts of finer texture, which have been thoroughly dried and are usually too thin and brittle to withstand any pressure or handling either within the site or later during study. The most common examples of this group are pieces of leaves and small stems. These are usually fragmentary when found, or else become so through handling soon afterwards. Identification is far more difficult in this group than in the first.

A third type of plant specimen, sometimes found in these sites, shows the results of various stages of decay or even possibly the results of pre-burial treatment such as cooking. Specimens of roots and tubers may fall into this category.

All three of these types of materials were represented by the plant remains found in the mummy bundle under discussion. A detailed description of these specimens follows, with the genera arranged in families according to the Engler and Prantl system of classification.

Gramineae

Zea Mays L.

The maize specimens in the mummy bundle consisted of one whole cob (30/4183), two broken cobs (30/4184, 30/4186) and several cob fragments (30/4185, 30/4187). In addition there are a number of kernels, some still

attached, others dissociated from the cobs. From these groups of specimens it was possible to reconstruct the type of maize.

The length of the intact cob is 6.2 cm., while the original length of the two broken cobs appears to have been approximately the same. The cob diameters of the three specimens average 23 mm.; the rachis diameters average 11 mm.; and the cob/rachis index is 2. The rows are irregular and spiral slightly to the left, and in one specimen double spiralling is present. The row number of the three specimens averages 12.2.

The cupules of all the cobs are hairy, and in those specimens where the rachis flap could be examined, it was found to be weak. There is a uniformity in the characteristics of the lower glume. The texture is fleshy with no evidence of either hairiness or venation. Likewise, there is a similarity in the upper glumes. They are slightly boat-shaped and of a chaffy texture. The surface is glabrous with no evidence of venation.

The kernels are gray-brown or in some cases black in color, with an average length of 7 mm. and an average width of 6 mm. The endosperm is hard and flinty, which points to the specimens as being a type of flint corn. This type of maize is common in pre-Columbian sites in Peru. There is no evidence of imbrication, but, in a few instances, there is a slight denting of the dorsal surface of the kernels. Mangelsdorf (1942) has found both flint and dent characteristics in the maize that he examined from Paracas Necropolis.

The presence of maize is recorded for the American Museum of Natural History bundle (Natural History, 41: 119–125), and both Yacovleff and Muelle (1934) and Carrion (1949) also mention it in their accounts of the bundles that they examined. Certainly from the descriptions of plant specimens from the archaeological sites of

Paracas, one is justified in placing maize among the more important staple foods of the people of the peninsula.

Cyperaceae

Scirpus spp.

Only fragments remain of the woven mat (30/4226) that had been placed about the bundle when it was lowered into the grave pit. The simple twill weave of the mat is made of the stems of a species of *Scirpus*, and the edge is reinforced with a tightly twisted cord of this same material.

The two fans that were included in the bundle differ little except in size. The larger (30/4179) has a maximum length of 18 cm. and consists of eight yellow wing feathers. The smaller specimen is a miniature fan (30/4178) and is made of yellow breast feathers. Its maximum length is 7.5 cm. The feathers of both specimens are undoubtedly those of parrots or macaws. The handles are constructed alike. In the case of the larger fan five or six culms of a species of *Scirpus*, and in the smaller specimen three or four culms of the same material, were double-looped in such a way as to hold the quills tightly. The free ends of the culms form the handles. These were cut off evenly, twisted slightly and then bound securely with cotton thread. Apparently the cotton thread in each specimen had held the quills before they were placed in the loops of the culms and then was wrapped about the culm ends.

Yacovleff and Muelle (1932) give "totora, *Scirpus totora*," as the material from which the baskets, mats and ropes were made that were recovered from the sites on Cerro Colorado. However, because this species of *Scirpus* is native to the high altitudes of the Andes (Beetle, 1945), it would seem more advisable to identify our culms merely as *Scirpus* spp. Several species of this

genus are found on the Peruvian coast and fragments of matting and ropes made of this reed have been recovered from other coastal archaeological sites.

Amaryllidaceae

Furcraea sp. prob. *F. occidentalis* Trel.

Two similar fiber slings had been placed in the bundle. One of these (30/4175) is approximately 82 cm. in length and the plaits of fiber average 8 mm. in width. The other sling (30/4170) is approximately 74.5 cm. long with plaits averaging 6 mm. in width. Both are made of the fibers of *Furcraea*. The plaited fiber is knotted at one end while the other end is allowed to fray for a distance of 7.5 cm., at which point the braid is carefully tied with cotton thread. This thread holds in place a cluster of short yellow feathers used to ornament the sling.

The braided cord (31/4160) which bound the limbs of the mummy is made of three-ply fiber of *Furcraea* sp. This specimen is in a poor state of preservation and is broken into lengths that vary from 5 to 66 cm. It is not possible to tell whether all of these had once been part of one length of cord. The width of these different pieces of braid measures from 4 to 8 mm. The braids retain their original shape until the separate ply are disturbed. It is then that the strands break into small pieces and thus prevent a more careful examination of the component fibers.

Compared with other bundles, it would appear that it was customary to bind the limbs in order to retain the body in a flexed position.

The Museum of Natural History mummy bundle (Natural History, 41: 119–125) and those examined by Yacovleff and Muelle (1934) and Carrion (1949) contained objects made of this fiber.

EXPLANATION OF THE ILLUSTRATIONS

PLATE LXXV. *Upper figure.* Unwrapped mummy bundle. The rolled fabric at the base of the bundle is a protective covering of modern burlap.

Lower figure. Mummy seated in the large basket after the textiles comprising the three outer layers had been removed.

Courtesy of the Peabody Museum, Harvard University

Plate LXXV

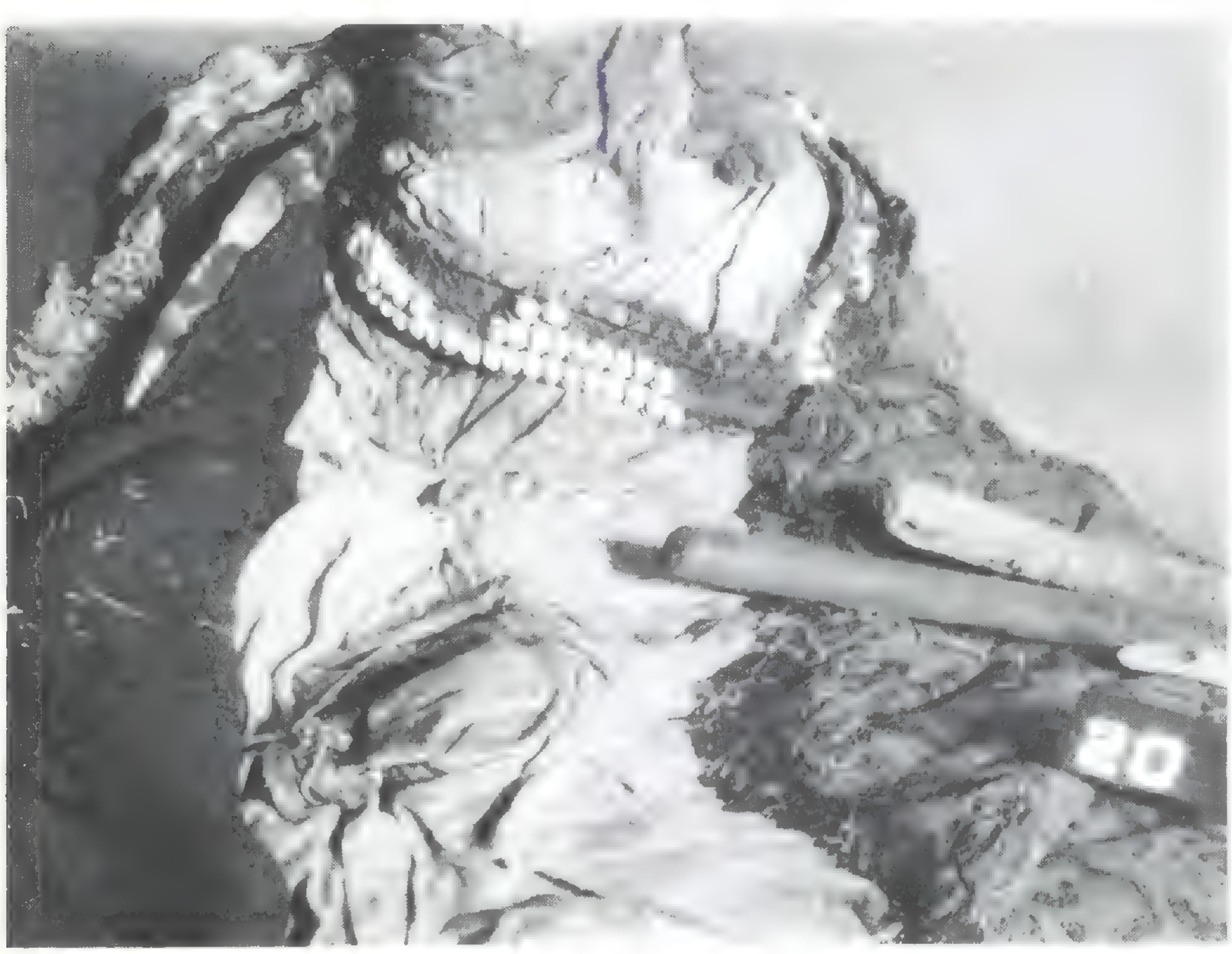
EXPLANATION OF THE ILLUSTRATIONS

PLATE LXXVI. *Upper figure.* The contents of the woven band found about the neck of the mummy: a small gourd, a fiber sling, a miniature fan, and shells containing raw cotton.

Lower figure. Details of Layer IV including a fiber sling around the edge of the turban, a feather fan, a baton, and a sinew-wrapped stick.

Courtesy of the Peabody Museum, Harvard University

Plate LXXVI



Arachis hypogaea L.

This species was represented in the bundle by four well-preserved, whole pods and several dissociated seeds (30/4182), all originally contained within the small coiled basket (30/4228). The pods are slender and thin-shelled, varying in maximum length from 3.4 cm. to 4.5 cm.; and in maximum diameter from 1.2 cm. to 1.3 cm. They are brown in color and have the heavy surface reticulations characteristic of many prehistoric Peruvian peanut pods. All have one pronounced dorsal, hump-like protuberance. The presence of this protuberance as well as the reticulations on the surface are also found in certain modern varieties. The seeds, two in a pod, have an average maximum length of 1.4 cm. and an average maximum width of 9 mm. They are either pointed or rounded at one end and are flattened at the other. The pointed or rounded surface faces the end of the pod, while the flattened one faces the other seed.

Peanuts are reported as part of the food offerings found in the bundle described by Yacovleff and Muelle (1934), as well as that at the Museum of Natural History (Natural History, 41: 119–125). Mangelsdorf (1942) identifies them among the plant remains from Paracas which he examined. In fact, this legume is one of the most common food plants recovered from Peruvian coastal sites.

Pachyrrhizus tuberosus Spreng.

One well-preserved root of this species (30/4190), commonly known in Peru as jiquima, was found in the bundle, and apparently had been placed originally in the small basket (30/4228) with other items of food. This specimen has a maximum length of 9 cm.; a maximum

diameter of 1.8 cm.; and it tapers to a point at each end. The exterior surface is a gray-brown color and is much wrinkled from drying, resulting in parallel, longitudinal furrows. The cream-colored interior is solid, and gave a positive reaction when tested for starch with an iodine solution.

The microscopic examination showed starch grains of kettle-drum, circular and polygonal shapes with a few twin aggregates. There are both small and large granules, the former being irregular and seeming to be predominantly two- and three-sided. The hilum is concentric; the lamellae indistinct. The grains measure 5.4 to 18 micra in diameter.

Yacovleff and Muelle (1934) report jiquima from the Necropolis of Paracas and state that roots of this species are frequently found in funeral bundles from this site. They further add that some of these specimens were originally identified as yacón (*Polymnia sonchifolia* Poepp. & Endl.), but that these have since been checked and found to be jiquima. In addition, they say that other roots from Paracas Necropolis have been identified as those of the sweet potato (*Ipomoea Batatas* (L.) Poir.). However, they do not accept these latter identifications.

Yacovleff (1933) has made an extensive study of this root and its presence on the southern coast of Peru in prehistoric times. He has identified not only the remains of jiquima, but pottery representations of it as well. In addition, he has attributed the elements of certain decorative designs to various parts of the plant.

Mangelsdorf (1942) identifies a root found in a mummy bundle from Paracas Necropolis as that of *Pachyrrhizus Ahipa* Parodi.

Euphorbiaceae

Manihot esculenta Crantz.

A root of manioc (30/4193) was included among the

food offerings recovered from the bundle. Decay has caused one part of the surface of the specimen to become softened and this area is easily broken. Its present maximum length is 9.9 cm.; its maximum diameter 2.3 cm.; and it tapers slightly toward the tip. The color of the smooth exterior surface ranges from a light to a dark brown. The fibrous, cream-colored interior gave a positive starch test with iodine.

A microscopic examination of this root showed both large and small starch grains. The granules, regardless of size, possess the same characteristics. They are in twin or triplicate aggregates of truncated grains which, when dissociated, are either circular or kettle-drum in shape. Their diameter measures from 9 to 21 micra. The lamellae are evident, but not distinct. The hilum, either a dot or cleft, is eccentric. These granules are indistinguishable from the granules of modern cassava.

Yacovleff and Muelle (1934) and Carrion (1949) report having found manioc in the mummy bundles which they examined, identifying these roots as *Manihot* spp. Mangelsdorf (1942) identifies a specimen of the root from another bundle from Paracas Necropolis as *Manihot esculenta* Crantz. Yacovleff and Herrera (1934–35) have pointed out that representations of this plant were often used by the ancient Peruvians for decorative purposes.

Malvaceae

Gossypium sp. prob. *G. barbadense* L.[1]

Cotton was found in the mummy bundle as raw fiber, yarn or thread and textiles. Four hanks and four balls of cotton yarn were included in Layer I. Thread had been utilized as a sewing element to tie small objects

[1] The specific name *Gossypium peruvianum* Cav., which has been widely used to describe Peruvian cotton, is now included with several other species under *G. barbadense* L. (Harlan, 1939, p. 48).

and to secure parts of other specimens. The cotton used in the construction of the handles of the feather fans is an illustration of the latter use. The study of textiles is a specialized field and is not within the scope of this paper.

There were a number of specimens of raw fiber in the mummy bundle. During the preparation of the body for burial, a large wad of cotton (30/4180) was placed over the face. A small amount of fiber had been stuffed into the neck of the bottle gourd (30/4200), apparently to protect the contents. In addition there were two shells each stuffed with raw cotton (30/4210–11) and several small objects of gold wrapped carefully in the same material (30/4201). These were found in a woven band about the neck of the mummy. Also included were four small rolls of cotton (30/4181), each averaging 3 cm. in length and tied with cotton string. These strings are 15 mm. long and were wrapped several times around the rolls and secured with a simple knot. The contents of these bundles were of particular interest. Two of the rolls contained small grains of a bright red pigment each approximately 1 mm. in diameter; the remaining two each held a small, amorphous pellet, 1 cm. long. These are a light brown color and in cross-section show a smooth, slightly oily surface of a light yellow hue. The samples of pigment were analyzed to determine whether or not they were of plant origin.[1] The red material proved to be cinnabar (Mercuric Sulphide), while the brown pellets are a mixture of powdered sphalerite (Zinc Sulphide) and an organic substance, either a wax or an oil.

Inorganic pigments have been found in other bundles from Paracas Necropolis. Powders of different colors had been placed in small pieces of skin and tied securely. Such specimens at first were thought to be of vegetable origin,

[1] These analyses were made by Mr. F. A. Gonyer of the Mineralogical Museum of Harvard University.

but upon examination proved to be inorganic in nature. Both Fester and Cruellas (1934) and Yacovleff and Muelle (1934) refer to cinnabar as having been used as a body paint by the people of Paracas, and it is indeed probable that sphalerite was used in a like manner.

The specimens of raw cotton described above vary in color. They are either a creamy-white, an earth-yellow or a tawny-brown. All the fibers examined show convolutions and they range in length from 15 to 29 mm. Many of these specimens are exceedingly brittle and when handled they quickly disintegrate.

Other mummy bundles from Paracas Necropolis which have been described in the literature contained specimens of raw and worked cotton similar to the materials included in the Peabody Museum bundle.

Cucurbitaceae

Lagenaria siceraria (Mol.) Standl.

Two specimens of gourds are included among the plant remains from the mummy bundle. One of these is a shallow dish (30/4199) with uneven edges made from the flower end of a large fruit. Its maximum diameter is 19 cm.; its maximum wall-thickness 4 mm. Part of the fine cotton netting, which had been placed about the neck of the mummy, still adheres to the bottom of the dish. There is no evidence of the original contents of this gourd.

The second specimen (30/4200) is a small, bottle-shaped gourd. It has a maximum height of 7.8 cm.; a maximum diameter of 6.8 cm.; and the mouth of the gourd contained a plug of cotton fiber. Inside was a small amount of fine, dark powder, which gave a negative reaction when tested for starch with iodine. However, when a specimen of this powder was examined under the

microscope, it was found to consist of infinitesimal bits of cotton fiber, probably from the brittle cotton stopper, and the remains of the pupae of several larvae. These have been identified as belonging to the saprophagous genus *Callitroga* (*Cochliomyia* and *Chrysoma*).[1]

Yacovleff and Muelle (1934) mention a gourd bowl found near the neck of the mummy that they examined. This specimen also contained both the powder and the larval remains. They state that the former constitutes the remains of certain organic substances. The description of the Museum of Natural History bundle (Natural History 41 : 119–125) mentions finding a calabash which had been tied in a net bag about the neck of the mummy.

The placing of gourd containers within the mummy bundles of Paracas Necropolis was apparently part of the customary procedure of their preparation. However, specimens of Lagenaria are even more commonly found in the burials of the earlier Paracas Cavernas cultural phase (Carrion, 1949).

Unidentified Plant Remains

Wood

A needle (30/4229) still threaded with cotton was found thrust through the final wrapping cloth of Layer III. Its maximum length is 15.2 cm.; its maximum width at the eyed end 4.5 mm.; and it tapers to a blunt, rounded end 2 mm. in diameter. In cross section the specimen is flat, with rounded edges, averaging 2 mm. in thickness. The surface of the needle is smooth. It appears that the needle had been fashioned from part of the stem of a large monocotyledonous plant, probably either the grass "caña brava" (*Gynerium sagittatum*

[1] This identification was made by Dr. Charles T. Greene of the Bureau of Entomology, U.S. Department of Agriculture.

Beauv.) or a species of "chonta" (*Guilielma* sp.), a palm. Both plants have been reported as having furnished the raw material for artifacts recovered from Paracas. In the botanical literature "caña brava" is reported from this section of the coast of Peru, whereas "chonta" is recorded from northern Peru and Bolivia. If the plant used in the manufacture of the needle is *Guilielma*, its presence at Paracas may be explained by the possibility of its having been an item of trade in prehistoric times.

A straight wooden stick (30/4230) of a light color had been placed in the folds of the mantles of Layer IV. It is 44.5 cm. in length and has a maximum diameter of 2.6 cm. At a distance of 3.4 cm. from the upper end of the stick, is a wrapping of sinew which extends for a space of approximately 7 cm. From this point the specimen tapers slightly to the lower end. The wood is partially decayed and has been attacked by insects. From microscopic sections, it has been identified as possibly willow.

A baton (30/4231) was also found in this location in the bundle. It is 57.4 cm. long, round in section and from 1.9 to 2 cm. in diameter. The wood is dark, heavy, fine-grained and hard. The entire surface appears to have been smoothed and polished, perhaps the result of much handling. This specimen has been designated a "baton" because of its convenient size for holding in the hand as a symbol of authority. The wood of which it is made has been tentatively identified as one of the Leguminosae, possibly *Caesalpinia* sp.

Roots

In addition to the roots of manioc (30/4193) and jiquima (30/4190) described above, four other root specimens were found in the bundle. Two of these (30/4192, 30/4198) were apparently part of the contents of the small basket; the other two (30/4191, 30/4195) were

found in the bottom of the bundle where they had fallen either from the same basket or from some undetermined location in the mummy wrappings. These four roots were too badly decayed to permit of their botanical identification.

Only one of these specimens (30/4191) gave positive results when tested for starch with an iodine solution, and the presence of a few starch grains could be detected when the specimen was examined microscopically. These starch granules are irregular in shape, as though they had become swollen and then crushed, and some of them show a three-cornered fracture. This condition might possibly have been caused by pre-burial heating in the presence of moisture, or again, might merely be the evidence of the degree of disintegration of the specimen. The more regular grains are round, but truncated on one side, and measure 6.95 to 12.51 micra in diameter. The central portion is denser than the outer, and in some of the grains single or clustered crystals appear in the denser area. Lamellae are apparent but not distinct. The hilum, is not evident, but may be hidden either by the crystals or by the above-mentioned cracks. This description is not consistent with that of starch grains of any of the available comparative material.

Twigs, Bark and Leaf Fragments

Two twigs or stems (30/4194) measuring 1.7 cm. and 2.5 cm. in length respectively, and a small piece of bark (30/4196) were found in the bottom of the mummy basket. These plant specimens gave no clues as to their botanical identification.

A small roll of alpaca fiber (30/4197) held together with cotton thread contained a small quid of macerated leaf tissue. A few of these leaf fragments were a light brown color and had a smooth epidermis. The others

were a dark brown and had a hairy surface. Leaf tissue found rolled into a quid and carefully wrapped would immediately suggest the leaves of coca (*Erythroxylon Coca* Lam.). Unfortunately, however, these fragments are too small and brittle to make identification possible.

Fibers

The larger of the two coiled baskets (30/4227) which were found in the bundle contained the mummy. Only the rim and sides of this specimen remain, the bottom presumably having disappeared as a result of the decomposition of the body which it held. The shape of the basket is that of a basin with a somewhat inverted rim. The diameter between the borders of the rim averages 61 cm.; the height of the sides approximately 22 cm. This latter figure probably closely represents the original height of the specimen.

The coils consist of a bundle of split leaves or stems, presumably those of a large grass. They average 7 mm. in diameter and consist of approximately 50 longitudinal shreds. These shredded strips average 5 mm. in width; 35 cm. in length, and in many instances are partially uncut and still attached to other strips at either the center or end of the coil. The material used in the sewing of the basket, as well as in the herringbone finish of the rim, consists of strips of fiber that closely resemble those that constitute the coils.

The material used in the construction of the basket is from a large monocotyledonous plant, probably either "caña brava" (*Gynerium sagittatum* Beauv.) or a cattail (*Typha angustifolia* L.). Both plants have been recovered from Paracas. Yacovleff and Muelle (1934) describe the funeral basket contained in the bundle that they studied as made of the stems of *Typha domingensis* Kunth, which is now referred to *Typha angustifolia* L.

The remains of the second and smaller coiled basket (30/4228) are too disintegrated to be identified. The largest fragment measures 5.5 cm. × 2.5 cm. and shows the start of the coiling at the base of the basket. The coil foundation is composed of flat strips of plant material which resemble those used in a similar manner in the construction of the large basket described above. The coil is begun by tightly wrapping this bundle of strips upon itself in such a way as to form a small rectangle with rounded corners. The identification of the sewing material could not be determined.

It is quite possible that this basket was originally placed in the lap of the mummy and that it presumably contained certain plant foods, as well as a wad of llama wool. Remains of these materials were found in the area in which the basket fragments were recovered.

Conclusion

The plant remains described above comprise thirty-five lots, each lot containing from one to several specimens. These are often only fragmentary. Of the total number of lots, twenty-three were identified, five were given only tentative identification, while seven remain undetermined. The plant specimens that were identified belong to seven families and eight genera. These are as follows:

Gramineae	*Zea Mays* L.
Cyperaceae	*Scirpus* spp.
Amaryllidaceae	*Furcraea* sp. prob. *F. occidentalis* Trel.
Leguminosae	*Arachis hypogaea* L.
	Pachyrrhizus tuberosus Spreng.
Euphorbiaceae	*Manihot esculenta* Crantz.
Malvaceae	*Gossypium* sp. prob. *G. barbadense* L.
Cucurbitaceae	*Lagenaria siceraria* (Mol.) Standl.

When this list of plant specimens from the Peabody Museum mummy bundle is compared with those from

other bundles from this site, we find it representative. Only *Scirpus* appears to be somewhat unique, but its absence in many other instances may possibly be due to oversight or the poor condition of the plant materials.

Plant remains found in other Paracas Necropolis bundles, but absent in the one at the Peabody Museum, include: remains of a sea alga (Yacovleff and Muelle, 1934); seeds of *Phascolus vulgaris* L. (Mangelsdorf, 1942; Yacovleff and Muelle, 1934); and remains of a fruit of *Capsicum annuum* L. (Natural History, 1938, pp. 119–125).

In addition, Mangelsdorf (1942) reports a specimen of *Capsicum annuum* and seeds of *Phaseolus lunatus* L. among the remains from a tomb at Paracas Cavernas; and also seeds of *Inga Feuillei* DC. among the materials from the general digging at Paracas Necropolis.

Although these lists of plant remains from the Paracas sites represent only fourteen species, there are many specimens that remain undetermined, the identification of which in all probability would greatly increase the list of plants known to have been utilized by the people of the peninsula of Paracas. All of the plants mentioned here have been found at other coastal Peruvian archaeological sites which cover a wide range in the cultural chronology of the area.

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STUDIES IN THE GENUS HEVEA V
THE STATUS OF THE BINOMIAL HEVEA DISCOLOR

BY
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THE name *Hevea discolor* (Spruce ex Benth.) Muell.-Arg. appears throughout the literature of *Hevea*, but it is used in such a confused way that serious doubt still plagues its exact meaning.

Until rather recently, *Hevea discolor* has been accepted as a binomial representing a distinct specific concept. In 1858, Baillon (Etud. Euphorb. (1858) 326) accepted *Siphonia discolor* as a valid species. Mueller-Argoviensis (in D.C. Prodr. 15, pt. 2 (1866) 717; in Martius Fl. Bras. 11, pt. 2 (1874) 299) also considered it to be distinct, placing it near *Hevea Spruceana* (Benth.) Muell.-Arg., because of its having obtuse staminate buds. In 1908, Huber (in Bol. Mus. Goeldi 5 (1908) 247) indicated the extreme closeness of *Hevea discolor* to *H. Spruceana* and suggested that one day it might be necessary to unite it with *H. Spruceana* and *H. similis* Hemsley. He stated: [translation] ". . . that *H. discolor* does not differ in essential characters, excepting in the size of the flowers, from *H. Spruceana* is a fact which is seen more and more as our study of the two species progresses. I

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myself must confess that it is impossible to distinguish . . . specimens which can positively be referred to *H. discolor*, in spite of the fact that the leaves of many of our specimens agree much more with this species than they do with *H. Spruceana*, according to Mueller's description . . . It is true that the few opened flowers of these specimens [*Poeppig 2595*, *Spruce 1171*] are much smaller than the completely developed flowers of *Hevea Spruceana*, but it seems to me that this can be due to their not having finished their growth. In our specimens from the lower Japurá and Teffé, from the area of *Hevea discolor*, there is such a curious mixture of characters of *H. discolor*, *H. similis* and *H. Spruceana*, that I have not been able to attribute them to one or the other species without reservation. At any rate, it is certain that the seeds of *Hevea discolor* from the mouth of the Rio Negro . . . and of *H. similis* from the lower Japurá are so similar to those of *H. Spruceana* from Obidos that, if they should be mixed, they could not again be separated."

In summary, Huber mentioned that *Hevea discolor* must be taken from the list of trees yielding good rubber and be placed amongst those of no commercial value, together with *H. Spruceana* and *H. similis*, with which concepts it may one day have to be united in one single species.

In his monograph of *Hevea*, Pax (in Engler's Pflanzenr. 4, 147 (1910)) retained *H. discolor* as a distinct species, placing *H. Spruceana*, *H. similis* and *H. discolor* together as species with obtuse staminate buds and a pilose under surface of the leaf. The only difference he noted between *Hevea discolor* and the other two concepts lay in the size of the staminate flowers.

Shortly thereafter, Huber (in Bol. Mus. Goeldi 7 (1913) 645–646, 650) accepted, apparently without hesitation, *Hevea discolor* as representing a distinct species,

allied to and coinciding more or less in geographical distribution with *H. Spruceana* and *H. similis*.

The problem of the real meaning of *Hevea discolor* was left unattended until 1925, when Ducke (in Arch. Jard. Bot. Rio Janeiro 4 (1925) 111) stated that *H. discolor* Muell.-Arg. and *H. similis* Hemsley, both from the State of Amazonas, have the appearance, the low-quality latex and the common name of *H. Spruceana*, and are separated from this species only by a few characters of little importance in the leaves and flowers; he was convinced that it was a question of mere varieties, having found, even among the trees of *H. Spruceana* at Obidos, a strong variation in the size of the flowers.

Subsequently, in 1929, Ducke (in Rev. Bot. Appl. 9 (1929) 630) stated that *Hevea discolor* represents a form, not even a geographical variety. Nevertheless, he pointed out that in the upper Amazon there is a predominance of trees whose leaflets are strongly pilose and which correspond especially to *discolor;* whereas in the lower Amazon, the leaves are usually almost glabrous. Ducke further noted that sterile specimens of his *Hevea Spruceana* forma *discolor* can easily be confounded with *H. Benthamiana* Muell.-Arg., a fact which he believes is the basis of the confusion in the literature of the past, which attributed the best rubber of the Rio Negro (extracted from *H. Benthamiana*) to *H. discolor*. Later, he reiterated the same opinion (in Arch. Jard. Bot. Rio Janeiro 5 (1930) 156). Five years afterwards, in his monograph of the genus (in Arch. Instit. Biol. Veg. 2 (1935) 239), he definitely reduced the binomial *Hevea discolor* to synonymy under *H. Spruceana*. This treatment is retained in Ducke's most recent synopsis of *Hevea* (Bol. Técn. Instit. Agron. Norte no. 10 (1946) 20, 23).

Recently, Baldwin (in Journ. Hered. 40 (1949) 48) has intimated that the well known and firmly established

binomial *Hevea Benthamiana* might have to be given up in favor of *H. discolor*. He stated: "*Hevea discolor* (Spruce ex Bentham) Muell.-Arg. was based on type material now usually referred in part to *H. Spruceana* (Benth.) Muell.-Arg. and in part to *H. Benthamiana* Muell.-Arg.; since *H. discolor* antedates the last name, *H. Benthamiana* would seem to be invalid."

This very problem has perturbed me for several years. In 1947, when I had an opportunity of studying abundant typical material of *Hevea* in various British herbaria, it appeared to me that the name *H. discolor* referred to a confused concept based upon two different species.

Notwithstanding the fact that the problem is fundamentally nomenclatorial and can be settled only by consultation with the literature and type specimens, I decided to let definitive studies of the question lie in abeyance pending a visit to and a sojourn in the type localities, during which a critical examination of many living individuals and the collection of ample topotypical material could be effectuated. This field work has been carried out, and the literature and type material have been studied again in the light of knowledge gained in the field. I am now convinced that, in accordance with the International Rules of Botanical Nomenclature, *Hevea discolor* may be rejected and that the well-established names, *H. Benthamiana* and *H. Spruceana*, may continue in an unaltered status.

A study of the status of *Hevea discolor* as a binomial necessitates a careful examination of Bentham's description and discussion (in Hooker's Kew Journ. Bot. 6 (1854) 369):

S. discolor, Spruce, MC.; foliolis breviter petiolulatis discoloribus subtus pubescentibus, glandulis parvis, panicula tomentosa, pedicellis flore brevioribus, calycibus obtusis, antheris 7–10 duplici serie verti-

cillatis.— *S. brasiliensis*, H.B.K., Nov. Gen. et Sp. vol. vii, p. 170 ? vix Willd.— *Micrandra ternata*, R. Br. Pl. Jav. Rar. p. 237.

Common in the gapó of the Rio Negro and of its tributary the Rio Uaupés, and known by the name of *Seringue de gapó*. The tree scarcely exceeds 25 feet, but the branches spread out horizontally, sometimes to a considerable distance. The milk is sparing, and elastic when dry. The leaves are like those of *S. elastica*, but always more or less pubescent underneath, generally 4 or 5 inches long; the flowers of a reddish-purple. The anthers are small and ovate, in two distinct verticils, sometimes both complete, with five in each, but one or two are frequently wanting in the upper one, and occasionally one also of the lower one. Some specimens in fruit of Mr. Spruce's first Barra collection were distributed as belonging doubtfully to the *S. elastica*. I have referred here Mr. Brown's species, on account of the pubescence of the underside of the leaf.

Bentham did not cite any specimens in connection with the description of *Siphonia discolor*. However, we find preserved at Kew two of Spruce's collections which have been annotated, one apparently in Bentham's own hand, as representing *Siphonia discolor*. One of these collections (*Spruce 1171*) was made "ad oram septentrionalem flum. Amazonum, ad ostium Rio Negro" in August 1851 and represents the expression of *Hevea Spruceana* which is abundant in the vicinity of Manáos. The other (*Spruce 2560*) was collected "prope Panuré ad Rio Uaupés in the period from October 1852 to January 1853 and is the type of Mueller's *Hevea Benthamiana*. We are certain that these two collections entered into Bentham's consideration of *Hevea discolor*, for we know: (1) that *H. discolor* was based upon Spruce collections; (2) that Bentham's geographical data ("common in the gapó of the Rio Negro, and of its tributary the Rio Uaupés") correspond to the localities of *Spruce 1171* and *2560;* and (3) that there are no other contemporary collections annotated with the binomial under discussion.

Furthermore, in Spruce's field notebook, preserved at Kew, we find the following annotation against his collec-

tion *2560* which indicates that he himself considered these two collections as representing the same concept:

2560. Siphonia discolor sp. n. gapó. Sm. milky tree 20 ft. Petioles $5\frac{1}{2}$ in. Lts. $6\frac{1}{8} \times 3$, subov.-ellipt. with abrubt subobt. apic. ven. wsh. and pubt. Pans. subpubt. Fl. very p. y. pubt., segm. acum. cf. Barra [Manáos] *Siphonia 1171.*

If we analyze, point for point, Bentham's description, we find that the leaflets, with their short petiolules, difference in color of the two surfaces, presence of hair on the under surface and small glands, possess characters which one finds to be common to the two concepts which *Spruce 1171* and *2560* represent. Indeed, vegetatively, and to a much lesser extent florally, *Hevea Benthamiana* often strikingly resembles *H. Spruceana*, a similarity which doubtlessly underlay Spruce's as well as Bentham's confusion of the two concepts as one. The paniceles are tomentose in both collections, albeit a distinct color difference may be noted; and the floral stalk in both is rather short. Bentham continues by stating "calycibus obtusis," probably meaning by the term "calycibus" *buds* or the *closed calyx*, in which case it is obvious that he is describing *Spruce 1171* and not *2560*, for in *2560*, the buds, as described by Mueller, are "longius acuminatis" and the calyx lobes "longe acuminatis." *Hevea discolor* was described as having from seven to ten anthers disposed in two whorls, a character which might refer either to *H. Spruceana* or to *H. Benthamiana.*

Following the technical Latin description, Bentham's English discussion provides additional characters of importance. The mode of branching which is described can be seen in individuals of both *Hevea Spruceana* and *H. Benthamiana*, but my experience leads me to associate it more frequently with the former than with the latter. The latex is said to yield an elastic rubber. This is an

interesting comment, since it is impossible to obtain an elastic rubber from true *Hevea Spruceana*; yet the quality of the product of *H. Benthamiana* is usually only slightly inferior to (and frequently as high as) that of *H. brasiliensis*, the source of the best rubber. In ascribing to the flowers of *Hevea discolor* a "reddish purple" hue, Bentham is very definitely describing a character of *H. Spruceana; H. Benthamiana* is known to have bright lemon-yellow flowers. Judging from the amount and kind of variation which Bentham describes for the anthers of *Hevea discolor*, we might be moved to think more of *H. Benthamiana* than of *H. Spruceana*. Although some variation is found in the number and placement of the anthers in the latter species, there is very much less instability than is evident in the former.

Bentham considered *Siphonia Spruceana* and *S. pauciflora* directly following the description and discussion of *S. discolor*. Describing *Siphonia Spruceana* as a plant of the banks of the Amazon below Santarem, Bentham stated (l. c. 370) that it has "numerous flowers, purple withinside, and much larger than in *S. discolor*," but he made no definite statement that he considered it to be allied at all closely to *S. discolor*. On the contrary, and rather surprisingly, he wrote (l. c. 370) of *Siphonia pauciflora*, a species which Spruce collected in rocky situations along the Rio Uaupés: "This is certainly near to *S. discolor*, and may prove a mere variety."

Although it is clear that Bentham based his description of *Hevea discolor* on the two collections, it is plain that the greater weight in both the English and the Latin description is given to *Spruce 1171* which represents *H. Spruceana*. I, therefore, typify *Hevea discolor* by choosing *Spruce 1171* as the lectotype of this concept.

We may then treat the binomial *Hevea discolor*, as Ducke definitely has done (in Arch. Jard. Bot. Rio

Janeiro 5 (1930) 156 and in Bol. Téen. Instit. Agron. Norte no. 10 (1946) 20, 23), as a synonym of *H. Spruceana*. The fact that *Hevea discolor* has page priority over *H. Spruceana* is of no significance, since Ducke, in 1930, first combined them under the latter binomial. Thus, this name, which has caused so much confusion and uncertainty, henceforth need not be a source of worry to students of the genus of the Pará rubber tree.

STUDIES IN THE GENUS HEVEA VI

NOTES, CHIEFLY NOMENCLATURAL, ON THE HEVEA PAUCIFLORA COMPLEX

BY

RICHARD EVANS SCHULTES[1]

THERE has long been confusion and uncertainty in the taxonomic and nomenclatural aspects of the study of the several concepts known as *Hevea Kunthiana*, *H. pauciflora*, and *H. confusa*. Recent studies in the field and in the herbarium have contributed much towards a clarification of some of the difficulties, but a more thorough understanding of the representatives of this complex, especially of those in British Guiana, would seem to be desirable. When further field work has been accomplished, I hope to present a detailed taxonomic study; but the need for an understanding of the proper names to use in this group is so urgent as to recommend the publication of our present knowledge of the nomenclatural aspects of the problem without further delay.

Hevea pauciflora (*Spruce ex Benth.*) *Mueller-Argoviensis* in Linnaea 34 (1865) 203.

Siphonia brasiliensis Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 7 (1825) 171.

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Siphonia pauciflora Spruce ex Bentham in Hooker Kew Journ. 6 (1854) 370.
Siphonia Kunthiana Baillon Étude Gén. Euphorb. (1858) 326.
Hevea brasiliensis (HBK.) Mueller-Argoviensis in Linnaea 34 (1865) 204, *pro parte*.
Hevea pauciflora (Spruce ex Benth.) Mueller-Argoviensis * [forma?] *membranacea* Mueller-Argoviensis in DC. Prodr. 15, pt. 2 (1866) 718.
Hevea membranacea Mueller-Argoviensis in Martius Fl. Bras. 11, pt. 2 (1874) 299.
Hevea Kunthiana (Baill.) Huber in Bol. Mus. Para. 3 (1902) 349.
Hevea membranacea Mueller-Argoviensis var. *leiogyne* Ducke in Arch. Jard. Bot. Rio Janeiro 6 (1933) 57.
Hevea pauciflora (Spruce ex Benth.) Mueller-Argoviensis ssp. *typica* Ducke in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.
Hevea membranacea Mueller-Argoviensis forma *leiogyne* Ducke l. c. 239.
Hevea pauciflora (Spruce ex Benth.) Mueller-Argoviensis forma *tipica* Ducke in Bol. Téen. Inst. Agron. Norte 10 (1946) 17.
Hevea pauciflora (Spruce ex Benth.) Mueller-Argoviensis forma *leiogyne* (Ducke) Ducke l. c. 17.

For some time now it has seemed to me that one specific concept is involved in the two binomials, *Hevea pauciflora* and *H. Kunthiana*. Study of the type of *Siphonia Kunthiana* in the Paris Herbarium in 1950 has convinced me that this suspicion was well founded. A critical examination of the type collection, a unicate represented only in Paris, was necessary before coming to a definite conclusion, because the type of *Hevea Kunthiana* is completely sterile, and the description alone affords few definite characters. A brief survey of the

history of these two binomials may help to clarify my reasons for relegating *Hevea Kunthiana* to synonymy under *H. pauciflora*.

In 1858, Baillon (l. c. 326) pointed out that *Siphonia brasiliensis* K., based upon the collection *Bonpland 5022*, was not the same concept as *S. brasiliensis* Willd. He proposed a new name for the Kunth concept, publishing it as follows: "*S. Kunthiana* + = *S. brasiliensis* K. non W. (Coll. Bonpland, n. 5022)." In accordance with Article 44 of the International Rules of Botanical Nomenclature, we must consider this as a validly published name, for "the name of a species . . . is not validly published unless it is accompanied . . . by the citation of a previously and effectively published description of the group . . . ." Although Baillon did not refer to the Kunth description by the work and the page where it was published, there can be no doubt that his citing of Kunth as authority constitutes a citation of the actual description (Humboldt, Bonpland & Kunth Nov. Gen. et Sp. 7 (1825) 171).

The specimen upon which the Kunth description was based and which Baillon cites in his substitution of "*Siphonia Kunthiana*" for "*S. brasiliensis* K." was collected in the upper reaches of the Orinoco in Venezuela and represents the same concept which was later collected by Spruce in the neighboring regions of the upper Rio Negro basin of Brazil and described as *Siphonia pauciflora*. This binomial and, more recently, *Hevea pauciflora* have gained wide acceptance, whereas *H. Kunthiana* has been largely ignored (Ducke in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 217), or relegated to synonymy with reserve under *H. brasiliensis* (Seibert in Ann. Mo. Bot. Gard. 34 (1947) 306). Ule (in Engler Bot. Jahrb. 35 (1905) 665) considered *Siphonia Kunthiana* a *nomen nudum*, and Pax (in Engler Pflanzenr. IV, 147 (1910)

128) followed him in this rejection of the name.

It is curious that Baillon failed to mention *Siphonia Kunthiana* in an article (in Adansonia 4 (1863–64) 284) which he published somewhat later than his proposal of the new binomial. This omission may possibly be attributed to the fact that the article in question dealt with the American *Euphorbiaceae* of eastern South America ("Brésil, Uruguay, Paraguay, Patagonia, etc.") and may not have been meant to include material from the Orinoco. Therefore, I do not believe that the omission has any real significance, especially since other species of *Hevea* (e.g. *Hevea guianensis* Aubl.) were likewise not included.

In 1865, Mueller-Argoviensis (in Linnaea 34 (1865) 204), when making the combination *Hevea brasiliensis*, considered *Siphonia Kunthiana* as a synonym of Kunth's *S. brasiliensis*.

In considering the problem of the real meaning of the binomial *Hevea brasiliensis*, Huber concluded (in Bol. Mus. Para. 3 (1902) 349; in Rev. Cult. Col. 10 (1902) 99; in Bull. Soc. Bot. France 49 (1902) 45) that the Orinoco material which Kunth had described as *Siphonia brasiliensis* should be called *Hevea Kunthiana*, and he accordingly made the indicated new combination from *Siphonia*.

Pointing out that the specimens which Kunth described as *Siphonia brasiliensis* were not referable to Willdenow's *S. brasiliensis*, Chevalier (in Rev. Bot. Appl. 16 (1936) 621) stated that their identity was still uncertain. He admitted the possibility that they may be referable to another Brazilian species already described, but he decided that, pending further material in flower and fruit from the original localities, it would be advisable to call it *Hevea Kunthiana* provisionally. Apparently unaware that Huber had made the combination in 1902,

Chevalier remade it. In a further discussion of the problem of the sterile Bonpland collection, Chevalier (l.c. 622) reported that it is very similar to *Spruce 2691*, the specimen upon which *Hevea pauciflora* and *H. membranacea* were based. The Paris material of *Spruce 2691* was annotated "*Hevea pauciflora* Muell.-Arg. ?" by Hemsley and "*H. brasiliensis* Muell.-Arg." by Poisson. Chevalier inclined to the belief that Hemsley's opinion was correct, but he decided to conserve the name *Hevea Kunthiana*.

In 1906, Huber (in Bol. Mus. Para. 4 (1906) 622) did not feel certain enough to assign a position to *Hevea Kunthiana* in his scheme of the genus. He placed *Hevea Kunthiana* in his Series *Obtusiflorae* under "Incertae sedis" together with *H. nitida* and *H. viridis*, both of which were, like *H. Kunthiana*, based on sterile material. He further stated (l. c. 648) that *Hevea Kunthiana* was a very poorly known species in spite of the fact that it seemed to him to be a source of rubber, but that it was certainly different from *H. Benthamiana* of the same area. In 1913, Ule (in Engler Bot. Jahrb. 50, Beibl. 114 (1913) 17), who had previously dismissed *Siphonia Kunthiana* as a *nomen nudum*, employed the binomial *Hevea Kunthiana* in an enumeration of species found in the northern Amazon.

Most recently, Baldwin has discussed the application of the binomial *Hevea Kunthiana*. In 1947, he wrote (in Journ. Hered. 38 (1947) 55) that "specimens collected on the Orinoco by Aimé Bonpland and early confused with *H. brasiliensis* are possibly correctly referred to *H. pauciflora*," in accord with Chevalier's suggestion. Two years later, he definitely accepted this suggestion (in Journ. Hered. 40 (1949) 48); he took up *H. Kunthiana* "for the Orinoco plant, for the '*seringa da serra*' of the upper Rio Negro, and for certain collections from British Guiana and Surinam."

Before leaving our discussion of *Hevea Kunthiana*, we should consider the history of the binomial *H. membranacea* and of the various other combinations in which the epithet *membranacea* has been used. *Hevea membranacea* as a name has no biological significance whatsoever, for Mueller described the concept from the same collection (*Spruce 2691*) that was already the type of *H. paucijlora*. The epithet *membranacea* has, however, persisted in the literature and has been bandied about in the nomenclature to such an extent that much uncertainty might easily be experienced by rubber investigators who are not familiar with all of the intricacies of the problem.

The first published mention of the epithet *membranacea* was made apparently in 1866, when Mueller-Argoviensis (in DC. Prodr. 15, pt. 2 (1866) 718 wrote the following:

> Ludit * *membranacea*, foliolis tenuiter membranaceis. [tree]. In Guyana anglica cum forma genuina speciei (Rich. Schomb. in hb. berol!). Haec praeter consistentiam foliorum nullo modo recedit.

It is not clear just what Mueller meant by the use of the asterisk, but it is important to attempt to clarify his meaning, if possible. This sign is not included in the enumeration of signs at the beginning of volume 15 of the Prodromus, so it must have been used in a sense which, at the time, was widely understood. Mueller might have employed the asterisk to mean subspecies or variety, for it was often used during the 19th century to designate subspecific variants, especially subspecies. Persoon (Syn. Plant. 1 (1805)) was apparently the first to use it in this way. An example may be cited (l. c. 2 (1807) 41):

> *Mesembryanthemum* 4. *linguiforme* α *scalpratum* Obs. Tres. sequentes tantummodo subspecies videntur: * *latum*, * *obliquum*, * *longum*.

Each of these subspecies is described. Another example from later in the century is that used by C. F. Nyman (Consp. Fl. Europ. 1 (1878) pg. ant. pg. 1):

Signa demum sunt explicanda, quibus subspecies, varietas, etc. indicandas utimur. Subspecies ideo (litteris minimis impressae) notantur asterisco (*), . . .

Nevertheless, the asterisk was also frequently employed to signify a subspecific variant of doubtful worth or the exact rank of which was uncertain. Persoon (Syn. Plant. 1 (1805) x) used it thus:

Speciebus obscuris, aut quoad sedum accuratori indagationi subjiciendis, signa crucis seu asteriscum apposui.

I believe that it is in this sense that Mueller used the asterisk, for we find a clear example of this use in Mueller's own writing (in DC. Prodr. 15, pt. 2 (1866) 749) under *Crozophora tinctoria* β *Hierosolymitana:*

Haec ludit * *brachypetala*, petalis florum foemineorum calyce paulo v. duplo imo 4-plo brevioribus.

In this case, we might call the variant a *forma* today; Mueller usually employed Greek letters for *varietas*, so that it is probable that he thought of the asterisk in this particular instance as a subvarietal variant or *forma*. This indirect evidence, coupled with his statement that the variant of *Hevea pauciflora* which he was calling *membranacea* "praeter consistentiam foliolorum nullo modo recedit" from the species, convinces me that the epithet *membranacea* was first published as a *forma*.

In his description of *Hevea pauciflora* forma *membranacea*, quoted above, Mueller based the concept on a collection made by Richard Schomburgk and preserved in the Berlin Herbarium. Then, a few years later (in Martius Fl. Bras. 11, pt. 2 (1874) 299) he raised the concept to specific rank under the name *Hevea membranacea*, giving a much fuller description. In so doing, he cited *Spruce 2691* as the only collection referable to *Hevea membranacea; Spruce 2691* was already the type of *H. pauciflora!* He failed to enumerate the Schomburgk

specimen under *Hevea membranacea*, but included it under *H. pauciflora*, referring to *H. membranacea* as "bene distincta." He does not distinguish *Hevea membranacea* from *H. pauciflora* directly, but from groups of other species, and he fails to refer back to his 1866 publication of the epithet *membranacea*.

It appears that Huber (in Bol. Mus. Para. 2 (1897) 252) accepted *Hevea membranacea* as a good species, for he enumerated it amongst species which "probably" were used in the production of rubber. In 1906, however, Huber (in Bol. Mus. Para. 4 (1906) 620) apparently made no mention of *Hevea membranacea* in his synopsis of the genus. Ule (in Engler Bot. Jahrb. 50, Beibl. 114 (1913) 17) likewise listed *Hevea membranacea* as one of the species of the northern part of the Amazon. In 1910, Pax (in Engler Pflanzenr. IV, 147 (1910) 126) kept up *Hevea membranacea* as distinct from *H. pauciflora*, separating it from *H. pauciflora* in his key (l. c. 120) on only one character — the membranaceous consistency of the leaflets, but carefully pointing out (l. c. 118) through what limited material this concept was known.

In 1929, Ducke (in Rev. Bot. Appl. 9 (1929) 629; in Arch. Jard. Bot. Rio Janeiro 5 (1930) 156) listed *Hevea membranacea* as occurring in British Guiana and the northwestern part of the Estado do Amazonas in Brazil. Shortly thereafter, he employed this binomial (in Arch. Jard. Bot. Rio Janeiro 6 (1933) 56) to designate trees growing on granitic soil at São Paulo de Olivença on the Rio Solimões and along the Rio Uaupés. He also described (l. c. 57) the variety *leiogyne*, differing primarily in a minor character of the pistillate flower. In 1935, Ducke (in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239) reduced this variety to a form. In 1946, he reduced *Hevea membranacea* to synonymy under *H. pauciflora* (in Bol. Téen. Inst. Agron. Norte no. 10 (1946) 24) and

transferred forma *leiogyne* from *H. membranacea* to *H. pauciflora.*

Seibert (l. c. 300) reduced to synonymy under *Hevea pauciflora* not only *H. membranacea*, but also all of the several trinomials referring to the concept which Ducke has variously designated by the epithet *leiogyne*. A study of representative material both in the field (in the type locality) and in the herbarium convinces me that the distinguishing character given for the *leiogyne* concept is not sufficiently stable to warrant the creation of a distinct taxonomic entity.

Hevea pauciflora (*Spruce ex Benth.*) *Mueller-Argoviensis* var. **coriacea** *Ducke* in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.

Hevea confusa Hemsley in Hooker Icones Plant. 26 (1898) 2, t. 2570; t. 2575, figs. 1–3, 12–13.

Hevea minor Hemsley l. c. 26 (1898) t. 2572.

? Hevea camporum Ducke in Arch. Jard. Bot. Rio Janeiro 4 (1925) 111.

Hevea humilior Ducke in Rev. Bot. Appl. Agric. Trop. 9 (1929) 624, 629, t. 18.

Hevea pauciflora (Spruce ex Benth.) Mueller-Argoviensis ssp. *coriacea* Ducke in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.

When Ducke described this subspecific variant of *Hevea pauciflora*, he pointed out that it "differs from *pauciflora* typica by the smaller size of all its parts, and by the thicker adult leaves which are rigidly membranaceous or (in the caatinga-vegetation of the upper Rio Negro) hardly coriaceous" [undoubtedly meaning "hard-coriaceous"]. Since its description by Ducke, this concept has been found to be relatively widespread and has commanded an appreciable amount of attention; the trinomial has been used in the literature (Schultes in Bot.

Mus. Leafl. Harvard Univ. 12 (1945) 10; ibid. 13 (1948) 117).

On a specimen of the collection *Richard Schomburgk 1381* preserved in the Paris Herbarium, there is an annotation of an unpublished binomial, under *Siphonia*, honoring the collector. The date and authorship of this annotation are unknown, but it represents apparently the earliest recognition of the concept as distinct from typical *Hevea pauciflora*.

In 1898, Hemsley described, after much study and hesitation, certain coriaceous-leaved specimens from British Guiana as *Hevea confusa*. Several of these collections (*Robert Schomburgk 817*, *Richard Schomburgk 1381*) had been cited by Mueller-Argoviensis (in Linnaea 34 (1865) 203; in DC. Prodr. 15, pt. 2 (1866) 717; in Martius Fl. Bras. 11, pt. 2 (1874) 300) as representing *Hevea pauciflora*, along with the type of this species (*Spruce 2691*); and Bentham himself considered these specimens to represent the same concept as the Spruce collection, for, in discussing *H. pauciflora*, he wrote that "apparently the same species is found also in British Guiana (Parker, and also Hancock in herb. Hook.–Robt. Schomburgk, 2nd coll. n. 817, Rich. Schomb. n. 1381)." I have spoken with botanists at Kew who conferred with Hemsley at the time he decided to publish *Hevea confusa* and have learned that he was not at all certain that he was dealing with a variant of specific rank. This is brought out in a report of a talk by Hemsley at the Linnean Society of London on April 4, 1901 (Journ. Bot. 39 (1901) 189: "It was formerly supposed that two species of *Hevea* might be distinguished in British Guiana, one (*Hevea pauciflora*) having thin leaves and a hairy ovary, the other thick, coriaceous leaves and a glabrous ovary, but, after examining a large number of specimens, Mr. Hemsley had come to the conclusion

that the differences were not constant, and that all the specimens exhibited might belong to one species and merely represented individual variation." This, incidentally, does not constitute a reduction by Hemsley of *Hevea confusa*, as Ducke (in Bol. Técn. Inst. Agron. Norte no. 10 (1946) 18) and Seibert (l. c. 301) have intimated; but it does indicate that Hemsley was uncertain. Uncertainty still persists. That the majority of the British Guiana specimens are different from typical *Hevea pauciflora* cannot be denied, but whether the difference is of a specific, varietal, or formal nature is the question.

In 1947, Seibert (l. c. 300) reduced *Hevea pauciflora* var. *coriacea* to synonymy under *H. pauciflora*, stating (l. c. 301): "The [*Hevea pauciflora*] complex has gone through various phases of taxonomic splitting, in which the Guiana material is usually considered as *H. confusa*. The Brasilian material from the Rio Negro and Solimões is referred to *H. pauciflora*, with coriaceous-leaved specimens as *H. pauciflora* var. *coriacea*. Although Hemsley described *H. confusa* as distinct from *H. pauciflora*, he later (1901) came to the conclusion that it was synonymous with the latter. More recently the feeling has been that *H. confusa* is synonymous with *H. pauciflora* var. *coriacea*."

Seibert stands alone in lumping together the coriaceous-leaved British-Guianan concept with the finer-leaved concept so common along the Rio Negro. He has pointed out (in Ann. Mo. Bot. Gard. 35 (1948) 120) that *Hevea pauciflora* is highly variable. It is true that there is a high degree of variability within this species over its widespread and disrupted range, but the two concepts in question are definitely distinct. This distinctness, recognized first in herbarium material by Hemsley, has been appreciated in the field by Ducke, Baldwin, and Schultes.

EXPLANATION OF THE ILLUSTRATIONS

PLATE LXXVII. HEVEA PAUCIFLORA (*Spruce ex Benth.*) *Muell.-Arg.* var. CORIACEA *Ducke* on the outskirts of Iquitos, Peru. This colony of trees appears to be that from which the type of HEVEA HUMILIOR *Ducke* was collected.

Photographs by RICHARD EVANS SCHULTES. *Courtesy of the Missouri Botanical Garden.*

In the upper Rio Negro, Baldwin (in Journ. Hered. 38 (1947) 57) noted the differences between the "seringa da serra" and the "seringa da caatinga," pointing out that "at São Gabriel on the Rio Negro one finds intergrades of the two": the former he called *Hevea pauciflora*, the latter *H. confusa*, thus intimating that the greater part of the British Guiana material and the "seringa da caatinga" of the Rio Negro belong to the same concept. He has continued to hold this opinion in later publications (Baldwin and Schultes in Bot. Mus. Leafl. Harvard Univ. 12 (1947) 335).

After having spent a year in the upper Rio Negro valley and having studied material in American and European herbaria, I am of the opinion that: (1) the British Guiana material which Hemsley called *Hevea confusa* is, with some variability, the same concept as the "serra da caatinga" of the upper Rio Negro; that (2) these are varietally distinct from typical *Hevea pauciflora* known principally from rocky situations along the uppermost reaches of the Rios Negro and Orinoco; and that (3) they represent the same concept described by Ducke as *Hevea pauciflora* var. *coriacea*. While a full biological study of the *Hevea pauciflora* complex should await still further field studies, an examination of the available herbarium material brings into evidence the fact that differences do exist. Nevertheless, I have not found sufficient differences in floral or fruiting structures to warrant a specific rank. In 1948 (in Bot. Mus. Leafl. Harvard Univ. 13 (1948) 117), I argued for the maintenance of a varietal rank pending further field studies. Ducke (in Bol. Téen. Inst. Agron. Norte no. 10 (1946) 18, 23) likewise has indicated his belief that the British Guiana material should be maintained as a variety, stating, however, that he was in doubt as to whether *Hevea confusa* should be kept up as a distinct variety of *Hevea pauci-*

flora or incorporated with *H. pauciflora* var. *coriacea*.

For many years, there has been some uncertainty as to just what the concept which Hemsley called *Hevea minor* represented. This species was based on a single specimen from the Río Casiquiare in southern Venezuela, preserved in the Kew Herbarium. During the greater part of the present century, the erroneous belief that *Hevea minor* and *H. microphylla* Ule were identical was accepted. A recent study (Schultes in Bot. Mus. Leafl. Harvard Univ. 13 (1947) 1) of type and authentic material has shown that *Hevea microphylla* is indeed distinct from *H. minor*. There still remained some doubt, however, as to whether or not *Hevea minor* represented a distinct species or a variant of some described concept. The paucity and apparent immaturity of the type and only specimen of *H. minor* made it unwise to conjecture. During the work in the upper Rio Negro basin in 1947 and 1948, I collected flowering and fruiting specimens from a number of caatinga-trees which are almost exact matches for the type of *Hevea minor*. One of these collections (*Schultes & López 9489*) came from a small tree at Cocuy, not far from the mouth of the Casiquiare and may, therefore, be considered almost topotypical; it is one of the collections most closely resembling *Spruce 3457*, the type of *Hevea minor*. I was unable to penetrate the Casiquiare itself, but many natives informed me that the riverside caatingas of the Casiquiare abound with this small rubber tree. It is found in abundance in most caatingas in the Rios Curicuriarí and the Vaupés, and upstream in the Rios Negro and Guainía. There is considerable variability in size of the trees, those growing in low-lying sandy caatingas which are flooded part of the year being extremely small, seldom exceeding fifteen feet in height.

The type of *Hevea minor* was in fruit and with seed.

EXPLANATION OF THE ILLUSTRATION

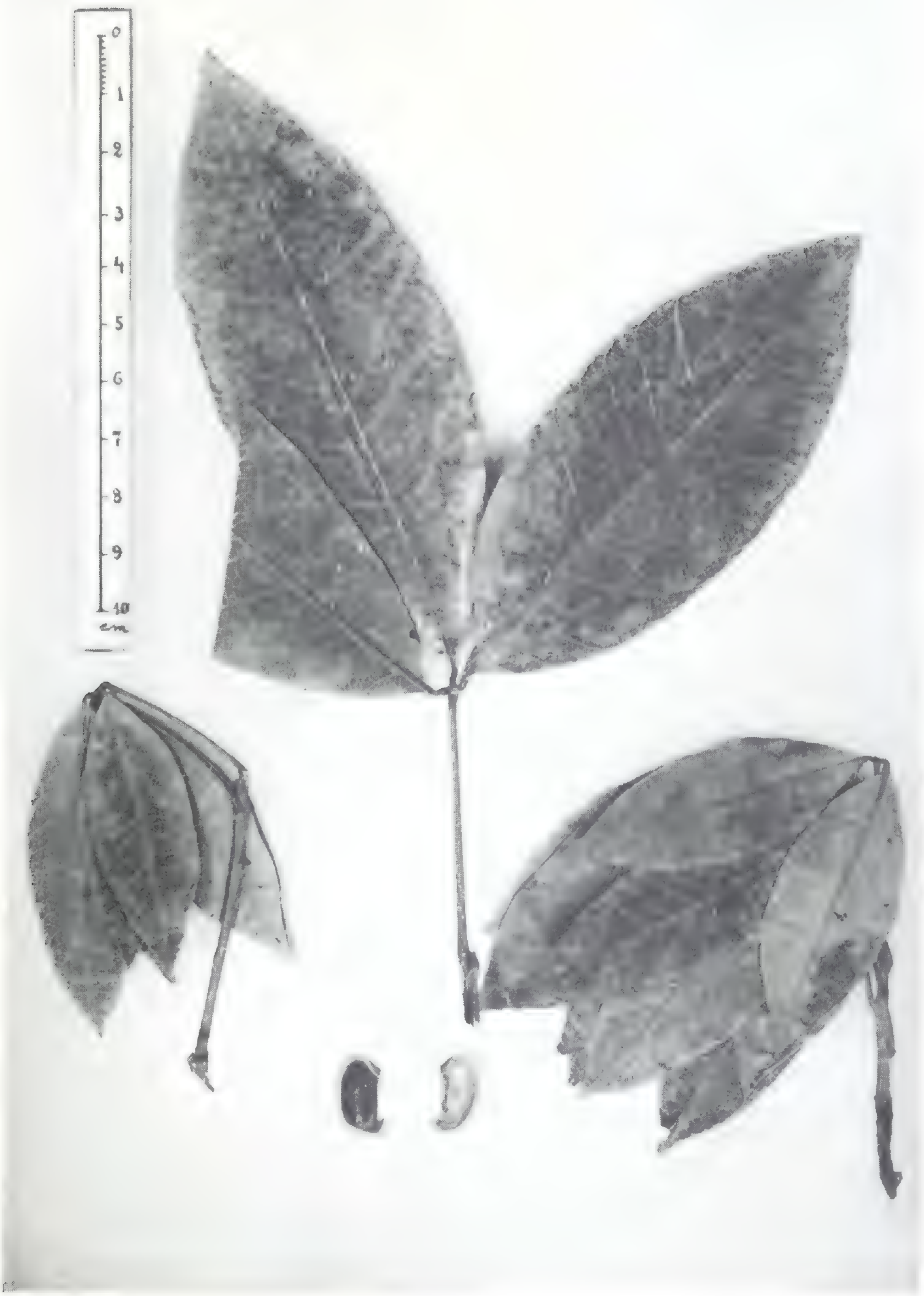
PLATE LXXVIII. Photograph of the type specimen of *Hevea minor* Hemsl., preserved in the Kew Herbarium.

Plate LXXVIII

EXPLANATION OF THE ILLUSTRATION

PLATE LXXIX. Photograph of the type specimen of *Hevea camporum* Ducke, preserved in the herbarium of the Jardim Botânico de Rio de Janeiro.

Plate LXXIX



During my work in the Rio Negro, it was possible to make both flowering and fruiting collections from the same individual in several instances. This enabled me to identify the material I collected with *Hevea pauciflora* var. *coriacea* by means of the flowers on the one hand, and with *H. minor* by means of the seeds on the other. Consequently, there can be no doubt that *Hevea minor* is the same as *H. pauciflora* var. *coriacea*. This has been suspected for some time (Schultes in Bot. Mus. Leafl. Harvard Univ. 15 (1952) 111), but now the former name must definitely be placed in synonymy under the latter. Because of the International Rules of Botanical Nomenclature requiring the use of the earliest name under the rank maintained, it is impossible to use the earlier epithet *minor* as the varietal designation.

In 1925, Ducke introduced to science one of the most unusual concepts in the genus when he described *Hevea camporum*. *Hevea camporum*, a small bushy treelet collected by R. Monteiro da Costa in the open granitic savannah country between the upper courses of the Rios Marmellos and Manicoré, right affluents of the Rio Madeira in Brazil, is remarkable because of the extreme reduction in the size of all of its parts. Like *Hevea minor*, it has been known through a single specimen which is in fruit. In 1945 and again in 1948, I attempted to reach the distant "campos" at the headwaters of the Rio Marmellos to study this concept in the field during its supposed flowering period, to introduce living material into experimental nurseries, and to make herbarium specimens for study and authentication. The first trip failed, due to lack of water in the headwaters of the Marmellos: the second, due to beri-beri. A very close study of the type which is preserved in the Herbarium at the Jardim Botânico in Rio de Janeiro, convinces me that, even lacking flowering material, we are safe in referring *Hevea*

camporum to the *H. pauciflora* complex. It certainly is not referable to *H. pauciflora* itself, and it would seem to be only very slightly more reduced in size than many normal individuals of *H. pauciflora* var. *coriacea*. Whether or not it may properly be called a *forma* of this concept must await further study, and, for this reason, I have placed *Hevea camporum* in synonymy under *H. pauciflora* var. *coriacea* with some reservation. The whole appearance of the leaflets (especially their glandular-calloused tips, which, as Seibert (in Ann. Mo. Bot. Gard. 34 (1947) 278) has convincingly demonstrated, are found only in *Hevea pauciflora*), of the tiny seeds, and of the valves of the capsule is strikingly like that of many individuals of *Hevea pauciflora* var. *coriacea*.

Interest was reawakened in *Hevea camporum* with the recent discovery, on flat-topped sandstone mountain savannahs in Amazonian Colombia, of another dwarf representative of *Hevea*. This Colombian treelet—*Hevea nitida* Mueller-Argoviensis var. *toxicodendroides* (Schultes & Vinton) Schultes, described as *Hevea viridis* Huber var. *toxicodendroides* Schultes & Vinton (in Caldasia 3 (1944) 25)—was shown to be specifically indistinguishable from *Hevea nitida* which, although usually a medium-sized caatinga-tree, may become a large forest tree in some regions (Schultes in Bot. Mus. Leafl. Harvard Univ. 12 (1945) 11). In 1945, I discussed (in Rev. Acad. Col. Ciénc. Exact. Físico-Quím. Nat. 6 (1945) 336) the superficial habitat resemblance between *Hevea camporum* and *H. nitida* var. *toxicodendroides* and quoted Dr. Adolpho Ducke who, in a letter dated May 5, 1945, had written to me: "I am inclined to think that *H. camporum* would eventually be (considered) a dwarf form of *H. pauciflora* var. *coriacea*, as your *toxicodendroides* is of the typical *viridis*. The leaves of *camporum* resemble small leaves of *pauciflora* var. *coriacea*." Ducke (in Bol.

Técn. Inst. Agron. Norte no. 10 (1946) 19) himself published this opinion. Baldwin likewise had arrived at a similar conclusion, stating (in Journ. Hered. 38 (1947) 59): "And it is my opinion that *H. camporum* . . . will be found to have the same relation to *H. confusa* that var. *toxicodendroides* does to *H. viridis*, they perhaps being ecotypes and nothing more.

Another concept which I am referring to *Hevea pauciflora* var. *coriacea* is *H. humilior*, described by Ducke in 1929 on the basis of small trees found growing on the outskirts of Iquitos, Perú. Since that time, Ducke, Baldwin, and Seibert have visited the region and have studied individuals of this concept. I have made four visits to what I believe to be the same colony of trees from which the type came (in a swampy pasture near the cemetery on the Morona-Cocha road) and have given much thought to the possible relationship of *Hevea humilior* to very similar individuals of *H. pauciflora* var. *coriacea* which I have seen near Leticia on the Río Amazonas and in the upper Rio Negro basin. I have come to the conclusion that *Hevea pauciflora* var. *coriacea* and *H. humilior* belong to the same concept.

Ducke (in Bol. Técn. Inst. Agron. Norte no. 10 (1946) 17) was the first to point this out, after he had revisited the type locality in 1945, and had restudied the problem in the light of knowledge he had gained in his experience with *Hevea pauciflora* var. *coriacea* in the Rio Negro. He wrote: [translated] "Trees of very low stature which were found on the outskirts of that city furnished me nineteen years ago with botanical material which served to create the supposed species *humilior* which I am now obliged to extinguish because it does not present a single character to separate it from *pauciflora* var. *coriacea* of the Solimões and Rio Negro."

In 1947, Baldwin stated: "In the marshes around

Iquitos, Perú, is what I consider to be a hybrid swarm of *Hevea confusa*×*H. guianensis* . . . . From that population at Iquitos, Ule described *H. paludosa*, and Ducke named *H. humilior*. The plants are doubtless extracts from a hybrid swarm, with strong resemblance to *H. confusa*."

In his study of the genus *Hevea* in Perú, Seibert (l.c. 302) discussed *H. humilior* in detail: "The type material, in both species [*H. humilior* and *H. paludosa*] is thought to represent segregating material from an hybrid swarm derived through interspecific hybridization of *H. pauciflora* and *H. guianensis* var. *lutea*. In both *H. paludosa* and *H. humilior* the material most closely simulates *H. pauciflora*, and recent collections have been labeled *H. pauciflora* var. *coriacea* by Ducke. The presence of *H. guianensis* var. *lutea* is morphologically more difficult to distinguish in the types of *H. humilior* than in *H. paludosa;* but, at least through bud acumination and pubescence characters, there can be little doubt of its presence.

"If *H. pauciflora* and *H. guianensis* var. *lutea* were the only species concerned in producing the Iquitos hybrid swarm the problem would be relatively simple. The swarm is complicated in that segregates of *H. pauciflora* ×*brasiliensis* also appear. Morphological evidence from the leaves, short-shoots, bud acumination and contortion, calyx-lobe acumination, and seed characters can leave little doubt of such a condition existing.

". . . The Iquitos hybrid swarm complex is still insufficiently known and collected to give more than faint, inconclusive evidence that certain specimens show influence of all three species within the same plant." In furtherance of his study of these Iquitos trees, Seibert appends (l.c. 317) a scholarly and original analysis of the material available.

Hybridization is probably of relatively common occur-

rence in areas like Iquitos, where man has greatly disturbed the natural habitat. Nevertheless, the role of hybridization in altering the trees which have been called *Hevea humilior* may have been exaggerated. Furthermore, these trees do not depart from *Hevea pauciflora* var. *coriacea*, in its broad sense, to such an extent as has been suggested.

Hevea pauciflora var. *coriacea*, as I understand it, embraces the material from the Guianas (*H. confusa*), from the widely spread localities of the great Rio Negro valley, from the Solimoes and Japurá, from Iquitos (*H. humilior*), and probably also from the Marmellos (*H. camporum*); it is certainly one of the most variable concepts of the genus, but I think that it is a concept enjoying a fundamental biological homogeneousness. The material of *Hevea humilior* from Iquitos, like that which I have collected near Leticia (Colombia) and which several workers have gathered at São Paulo de Olivença, is, indeed, different from the more northern representatives, but I am in agreement with Ducke that it can be referred, without any reservation, to *H. pauciflora* var. *coriacea*. Later, we may possibly find that *Hevea humilior* as well as *H. camporum* should be accommodated within *H. pauciflora* var. *coriacea* in the rank of *forma*, through the use of a trinomial, but such a step must await further morphological studies for final settlement. Since these present notes are not primarily taxonomic, but are meant to be chiefly nomenclatural, I do not propose to discuss the minor variations and differences at this time, nor do I intend to consider here the suggestions which Baldwin and Seibert have made concerning the genetic makeup of the concept. These topics will be deferred for consideration in a general biological study of the taxonomy, morphology, and phytogeography of the *Hevea pauciflora* complex.